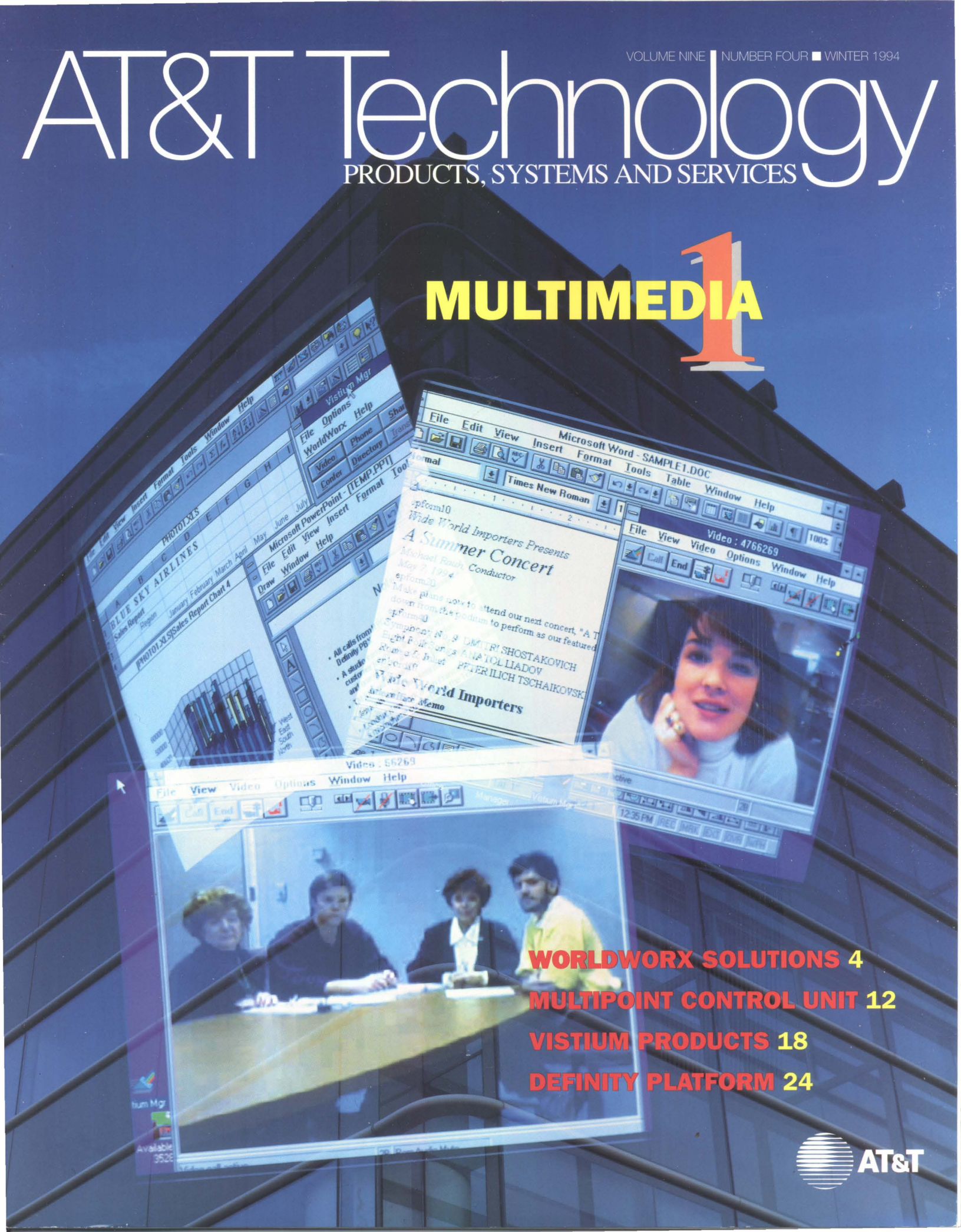
VOLUME NINE | NUMBER FOUR ■ WINTER 1994

AT&T Technology

PRODUCTS, SYSTEMS AND SERVICES

MULTIMEDIA 1



WORLDWORX SOLUTIONS 4
MULTIPOINT CONTROL UNIT 12
VISTIUM PRODUCTS 18
DEFINITY PLATFORM 24

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STATEMENT OF PURPOSE

The purpose of *AT&T Technology* magazine is to inform our customers about AT&T's products, systems, and services; to explain the technologies underlying them; and to discuss broad trends in AT&T technical developments and their applications.

VOLUME NINE | NUMBER FOUR ■ WINTER 1994

AT&T Technology

PRODUCTS, SYSTEMS AND SERVICES

THE SINGLE FACE OF MULTIMEDIA 2

James G. Cosgrove, Leonard D. McCarthy, Jr. and Carl Pavarini

Single access to multiple communications media is bringing revolutionary changes in the way people anywhere can work together — seeing, hearing, sharing information in its various forms.

WORK-TOGETHER CALLS EXPAND YOUR CAPABILITIES 4

Ernest G. DeNigris

AT&T WorldWorx℠ Personal Conferencing Service brings together the depth of information available in a face-to-face meeting with all the resources of each participant's office.

CUSTOMERS SAY: PERSONAL MEANS MORE PRODUCTIVE 8

Carl Pavarini

Face-to-face meetings across thousands of miles or just one build trust, ease working relationships, support major undertakings. AT&T WorldWorx™ Solutions make it almost like being there in person.

MCUs HELP TAKE THE WORRY OUT OF BEING THERE 12

Mark J. Koenig and Martin J. Welt

With rising costs and global competition, organizations must improve productivity and control spending. AT&T's Multipoint Control Unit enables them to save time and money through multipoint videoconferences.

VISTIUM PRODUCTS GIVE ANOTHER POINT OF VIEW 18

Robert M. Howe III

Videoconferees can now attend meetings right from their offices with AT&T's Vistium™ Family of products turning computers such as the AT&T Globalyst™ PC into videoconferencing workstations.

DEFINITY PLATFORM DELIVERS MULTIMEDIA TODAY 24

L. Denise Bearden, Amy R. Flax and Bryan S. Katz

The DEFINITY® Communications System provides multimedia calling capabilities from desktops and conference rooms while retaining all the rich business features and functionality valued for voice calling.

VIRTUAL MEETING SERVICE—CONCEPTS AND ARCHITECTURE 28

Ashok K. Kuthyar, Ram S. Ramamurthy and Peter H. Stuntebeck

Computer-assisted virtual meetings not only can be just as effective as face-to-face meetings, but also can improve on the real thing. Additional development describes what virtual meetings could be like someday.

NEW PRODUCTS, SYSTEMS AND SERVICES 16, 22

On The Cover

Multimedia technology lets people interact electronically in multidimensional ways that are richer and more productive — seeing and hearing customers and associates anywhere, working collaboratively on shared information of many kinds.

JAMES G. COSGROVE
LEONARD D. McCARTHY, JR.
CARL PAVARINI
AT&T

The Single Face Of Multimedia

Multimedia—the integrated use of two or more communication media to convey information—is often described as revolutionary; and little wonder. Its emerging capabilities, offered by unified, intelligent networks, are transforming how we interact with people and information as we work, learn, conduct transactions, spend leisure time.

The imagery of a vast global network of networks—an information superhighway—is based on the reality and promise of multimedia communication. Multimedia will enable us, simply, to combine whatever media we need at the moment to send, receive, or share with others anywhere, our choice of speech, music, messages, text, data, images, video, animation, perhaps even the multidimensional, information-based experience called virtual reality.

But though its effects will prove revolutionary, multimedia's emergence has required countless evolutionary advances in technology and gradual changes in how people relate to the technology that serves them.

From multimedia technology comes an environment more true to life than all its separate parts.

TECHNOLOGY PAVES THE WAY

The technology that makes multimedia possible builds naturally on core technologies from AT&T Bell Laboratories that have benefited AT&T and its customers since before people spoke of multimedia and the information superhighway. AT&T's strengths in compression technology, broadband switching and transmission, high-performance computing, acoustics, call-control software, fiber optics and human factors, for example, have cleared the way for AT&T and its customers to see the multimedia revolution and hasten its coming.

In addition, three powerful, evolutionary trends underlie multimedia—influencing its growth and being influenced by it. First is the continuing digitization of network communications and information content. Conversion to digital form allows multiple kinds of information to be integrated, opening new possibilities for display, transmission, processing and storage.

With less than one percent of the world's library content in digital form today, the future of information availability appears limitless. Personal intelligent assistants will be needed to help people get the information they want. Applying that concept, AT&T PersonaLink℠ Services offers "smart agents," software programs that are activated by electronic messages in the network and that find, access, process and deliver information to the requester.

A second trend is that computing power continues to increase at decreasing cost. Networks, and the PCs and other terminal devices that access them, can cost-effectively become more and more intelligent and interactive. The extension of this is software architecture that reaches end-to-end across the network, encompassing the network interfaces of access terminals and communications software packages. In a third trend, technology and economics, even environmental factors, have stimulated people's readiness to substitute networked solutions for travel. Meeting no longer need imply being there. People separated geographically can collaborate productively.

SINGLE ACCESS, MULTIPLE CHOICE

In the realm of multimedia, integration is key. Use two or more media simultaneously from one terminal. Send a voice-annotated fax; edit a report collaboratively with a distant colleague, watching his or her handwritten changes show up on your screen and adding your own; participate in an international videoconference using large-screen equipment.

Single access to networked multimedia creates an environment more true to life than all its separate parts. And the equipment that delivers it can seem quite ordinary. Try multimedia from an office with familiar desktop equipment—a PC and telephone. Only

the small camera atop the PC hints that behind the scenes technology is integrating the media that enable you to see and be seen, hear and be heard, collaborate, retrieve data for sharing. Used awhile, multimedia may cease to seem remarkable, its capabilities are so natural and familiar. It's easy to imagine that one day the word multimedia will no longer be needed. It will simply be an expected part of how we communicate.

To present the single face of multimedia to users, providers must offer voice/video/data dialtone that signals a network's readiness to deliver information in any form to any media-appropriate terminal. Today's public networks can accommodate a wide variety of multimedia communication services. Those network services are accessible through many kinds of terminals, hosted by countless network-infrastructure devices. The result for users is a multifaceted tool for getting work done.

SIGNS OF THE REVOLUTION

AT&T's commitment to serving customers in new ways through multimedia communication is engaging the combined efforts of its internal businesses, its R&D organizations at Bell Laboratories, and many external partners. The resulting host of products available from AT&T puts technology to work on desktops and in network infrastructure to deliver multimedia services.

Back in the office scenario, for example, where an ordinary PC behaved like a videoconferencing workstation, AT&T Vistium™ products created the transformation. Vistium hardware boards and software products allow videoconferencing and simultaneous collaborative file-sharing over an ISDN basic-rate interface (BRI) or other digital line using a 386-, 486-, or Pentium-based PC and telephone equipment.

A Vistium-equipped PC could be one of the family of AT&T Globalyst™ computers, which includes a videocamera and multimedia features such as speakerphone, voice mail and fax capabilities. With Vistium, PCs are network-access endpoints for AT&T WorldWorx™ Solutions, which offer videoconferencing applications that include distance learning, remote access to experts, customer sales and support, and collaborative work teams, in the U.S. and 22 other countries.

Working behind the scenes is the AT&T PassageWay™ telecommunications interface, developed with Novell. By connecting a company's local-area computer network to its PBX, the PassageWay interface links the desktop phone and PC. The PBX in that scenario could be the AT&T DEFINITY® Communications System, AT&T's multimedia communications platform. Among the multimedia offerings that use the DEFINITY System platform are the AT&T Intuity™ Voice Processing Solutions, which provide advanced messaging services that include voice.

Also working off the DEFINITY system is the AT&T Multipoint Control Unit (MCU), a system that provides voice-, video-, and data-bridging functions to enable multipoint videoconferencing with up to 24 locations. Because the MCU incorporates international standards, conferees can use access equipment from different vendors. For groups at work in meeting rooms, that access equipment can be AT&T's Group Video Systems, which offer large-screen videoconferencing on stationary or rollabout equipment.

Both this issue of *AT&T Technology* and the one that follows focus on multimedia. In this issue, you'll read about:

- ☐ WorldWorx Personal Conferencing Service;
- ☐ How four large customers—a major manufacturer, a healthcare hub, a multicampus university and a forest-products company—are using multimedia;
- ☐ Two key multimedia products: AT&T's Multipoint Control Unit for the voice-, video-, and data-bridging functions of multipoint videoconferencing, and the Conference Reservation System for videoconference scheduling;
- ☐ How the Vistium Family of hardware and software products is bringing multimedia to users' desktops by turning computers such as AT&T Globalyst PCs into videoconferencing workstations;
- ☐ The DEFINITY Communications System's role in multimedia;
- ☐ And the concepts and architecture of Virtual Meeting Service.

The next issue will include marketing and technology drivers underlying multimedia: digital compression, video servers, broadband access, simultaneous voice and data, and messaging.

For AT&T and its customers, the multimedia revolution is now. Participating as providers and users, we might look ahead and speculate on such things as the kind or kinds of terminal devices that will be in use when the multimedia revolution no longer seems revolutionary. Will there be a single favored kind, as widespread as voice telephones today, that gives a user access to all that multimedia can deliver? Such questions will be answered over time in markets, laboratories, and wherever providers listen to their customers. Participating in the multimedia revolution, we shape its direction.

James G. Cosgrove

James G. Cosgrove is vice president and general manager of Business Multimedia Services for AT&T Business Communications Services in Bedminster, N.J. His organization is responsible for developing and delivering multimedia communications and computing services for business customers worldwide. Mr. Cosgrove joined AT&T in 1974. He has a B.S. degree in physics from Louisiana State University, an M.S. in management from Massachusetts Institute of Technology, and a Ph.D. in physics from the University of Texas.

Leonard D. McCarthy, Jr.

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Carl Pavarini

Carl Pavarini is vice president of Emerging Markets for AT&T Global Business Communications Systems in Basking Ridge, N.J. He and his team are responsible for the ongoing development of GBCS's strategic roadmap for multimedia, and for the support of many emerging-offers market groups. Mr. Pavarini joined AT&T in 1973. He holds B.S. and M.S. degrees in electrical engineering and a Ph.D. degree in systems engineering, all from Rensselaer Polytechnic Institute.

ERNEST G. DENIGRIS
AT&T

Work-Together Calls Expand Your Capabilities

WorldWorx Network Services help people work together more productively, whether their offices are side-by-side or an ocean apart.

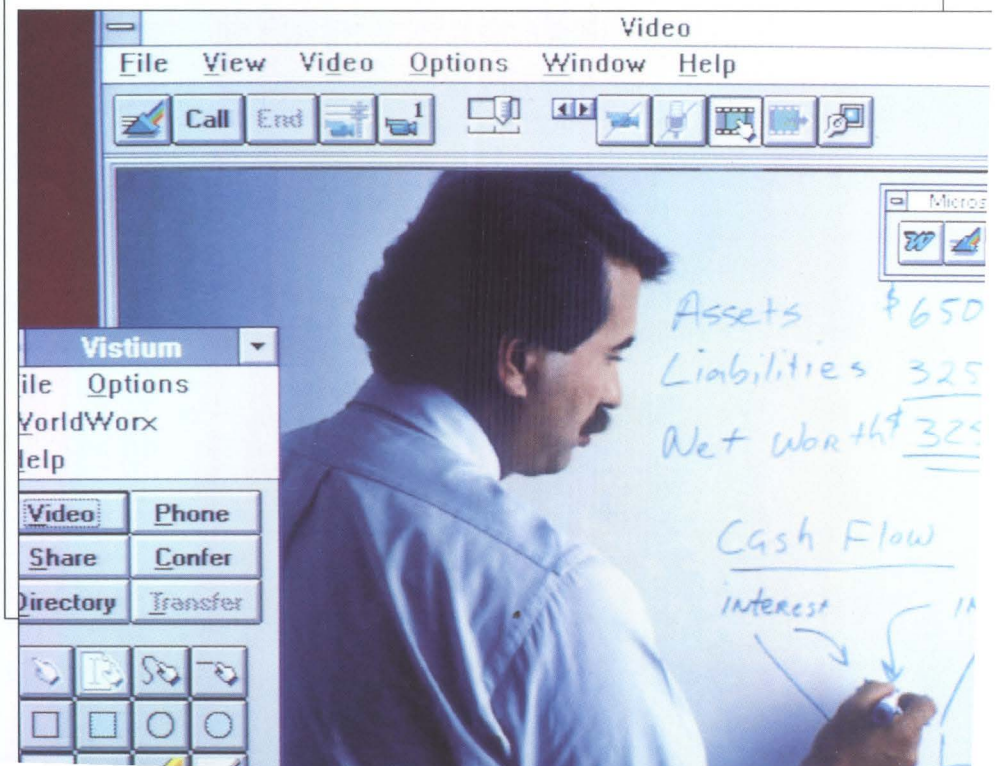
AT&T WorldWorx℠ Personal Conferencing Service is talk—plus seeing people—plus data—plus sharing of work—across any distance—for people in 27 countries. That's a mouthful. But it's hard to define the service succinctly since it encompasses so much, and because the possibilities are so varied. And it's almost impossible at the introduction of a new technology to know how people will use it. But we can say it will change the way we work as has the fax, the PC, or some other technology that has surprised—or overwhelmed—us in the past. A WorldWorx call is a collaborative one, a work-together call that's interactive and real-time. It improves effectiveness within organizations and in their dealings with customers and suppliers.

Imagine if the next time you want to fax something to the person you're talking with on the phone, you don't have to hang up, pull the document out of a drawer, go down the hall to feed it into the fax machine, and then call back. Instead you can simply bring the report up on your PC, hit a key or two, and continue to talk—within seconds, the report is up on your colleague's screen, too.

Or suppose when editing the draft of a sales proposal, you don't have to send it (even by e-mail) to your co-authors, wait till they have time to make their edits and send it back, and then reconcile all their changes into a second draft to go back out for comment.

Think about training your salespeople on a new product's features without flying them to headquarters at great cost in dollars and time. You could set up a teleconference to give them the latest news and sales information to get their feet on the street faster so they can start

Up to 22 conferees can participate in an audio/video/data/image worksession.



selling sooner.

The kicker is that this collaboration is relatively inexpensive. It happens over a 112- or 128-kilobits-per-second (kb/s) transmission link. What's needed is an ISDN line or two switched digital 56-kb/s lines from the local-exchange carrier, or a digital PBX, terminal equipment, and WorldWorx Personal Conferencing Service.

INITIAL SERVICE

WorldWorx Personal Conferencing Service is a network-based service that's available now for two-party calls in the United States and selected countries in Europe, Asia, and the Caribbean. The WorldWorx Network also links people using personal workstations with people using conference-room video systems that also operate at 128 kb/s. The service provides a broad set of features that will include:

☐ Availability. The service is available to devices that meet the ITU-T H.320 video standard and T.120 data standard, such as PCs equipped with Vistium™ Boards, Vistium Personal Video Systems (see article on page 18), compatible equipment from other manufacturers as well as devices that comply with Intel's personal conferencing specifications.

☐ Multipoint collaboration. People in 27 countries can participate in an audio/video/data/image work session. Initially, users will call a bridging operator to link sites; later this year, they'll be able to set up the teleconference themselves by dialing the phone numbers of the other parties.

☐ Audio add-on. Audio links can join the conference; the audio end-points can be teleconferencing bridges joined by a number of other participants.

☐ Choices in presentation of images. Users can collectively choose to see each person speaking in turn, or view the chairperson of the meeting.

☐ Video options. Users can transmit images stored digitally or on tape.

☐ Data conferencing and PC collaboration. One person can give others access to the spreadsheet or word-processing document on his or her PC.

☐ Conferee identification. At any time, any participant can see the name of any other person.

☐ Security. Security is maintained for data in the user's shared and non-shared files, as well as data on usage of the service. The network requires passwords to enter a meeting.

☐ Choice of network services. You can choose ACCUNET® Switched Digital Service or Software Defined Data Network Service for one or more 128 kb/s transmission links through the WorldWorx Network. Business customers with many users can send groups of personal teleconferences via their T1 or higher-rate transmission links.

A VISION FOR THE FUTURE

WorldWorx Service will help users plan their future communications so that systems and services bought now won't be obsolete next year or in the next decade. The service may include many of the components of the Virtual Meeting Service described in the article on page 28. Features that will be offered include:

☐ Operating compatibility among desktop systems adhering to the ITU-T H.320 and T.120 standards and those adhering to Intel's personal conferencing specifications.

☐ Storage and retrieval. Video mail may be introduced in 1996.

☐ Directories. AT&T will compile and maintain public directories of WorldWorx Personal Conferencing Service users, electronically and on paper.

☐ Speed matching. The network will translate among different videoconferencing transmission rates, so group video systems operating at 384 and 768 kb/s can join in the same meeting with personal video systems.

Goals already set for the longer term include increased interoperability so messaging systems, peripheral equipment, and diverse hardware and software platforms can all be included transparently within the work-together call. And there'll be more storage and retrieval so users can store documents, video images, and perhaps entire meetings in the network.

Increased flexibility in viewing other participants on the call will enable more partic-

The network will translate among different video-conferencing transmission rates.

GETTING STARTED

Say your business has headquarters in Tulsa, Oklahoma, with branches in Ann Arbor, Michigan, Richardson, Texas, Barcelona, Spain, and Singapore. Knowing how expensive it is to get people together, you decide on WorldWorx Service. What's next? You need three things: end-point terminals, local-access lines, and WorldWorx Service.

Call AT&T first: 1-800-828-WORX. We'll give you access to the WorldWorx Network, allowing you to choose between ACCUNET Switched Digital Service and Software Defined Data Network service. WorldWorx service now links 27 countries with full video/voice/data service, with additional people on audio links.

We'll also advise you about the terminals and software that let your people collaborate. You can use a Globalyst™ PC. It comes equipped with Vistium Share Software and videocamera. Or you can buy the Vistium boards and software to install in the AT-bus-compatible PCs you already own.

If you choose to use your own PCs, they should have at least the Intel 386 microprocessor or its equivalent. The Vistium 1300 three-board set is for older 386-based PCs; the Vistium 1200 board is for PCs with 486 or faster chips (see the article on page 18).

Vistium software provides the data-sharing capabilities. There's a choice of cameras that mount atop the PC; the Model 200 is manual focus; the Model 300 is auto-focus with remote control of pan, tilt and zoom.

The third step is lining up ISDN or switched digital 56-kb/s service from your local-exchange carrier to link your various locations to the WorldWorx Network. Initially, you'll need to do that yourself; later in 1995, AT&T plans to offer a service that will handle all your connections end-to-end.

For dispersed meetings, multimedia can help convey complex information to groups of participants located nearby or at distant locations.

THE VIRTUAL GET-TOGETHER

Desmond Flynn, of Ace Software, Inc., needs to have a virtual meeting with some of his staff and the company's key suppliers throughout the country. They have three days to respond to a NASA request for quotation and need to finalize their response and agree to the schedules. There'll be 20 conferees plus the company's CEO, who's vacationing in the Maine woods and will call in on his cellular phone for the results near the end of the meeting.

Flynn, the conference chairperson, calls 1-800-828-WORX, the Customer Care Center (CCC), and asks an agent to make a reservation for the next day from 1 to 5 p.m. Eastern time. In turn the agent asks the Customer Care Server for Flynn's account information, then asks the Meeting Reservation and Control Server (MRCS) to determine the availability of bridge ports for that time. Flynn provides the names and numbers of the conferees, the agent enters the reservation request and the MRCS allocates the multipoint control unit (MCU) resources.

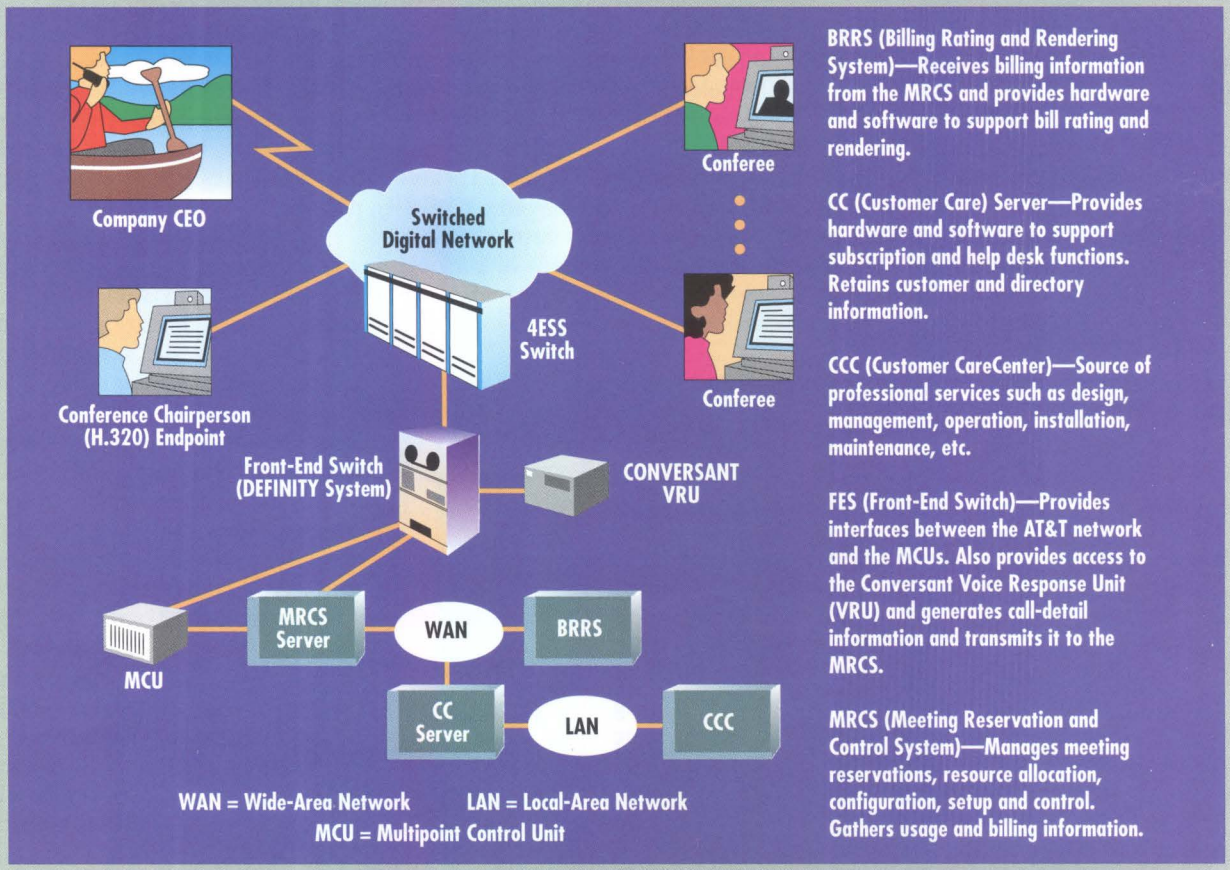
At 1 p.m. the next day, the MRCS commands the MCU to place the two-circuit switched ISDN data calls to each of the 20 endpoints, which it does, through the front-end switch. As each endpoint answers, an authentication-and-password exchange process takes place between the endpoint and the MCU. Three endpoints, however, don't answer so the MRCS retries them every five minutes for 15 minutes. (This was provisioned into the MCU at its installation).

The virtual meeting starts at 1, and the conferees exchange identities and electronic business cards, which are sent from the endpoints and stored during the meeting in the MCU. At 1:15, one of the three silent endpoints answers when the MCU retries and is authenticated by the MCU, which alerts the other conferees and connects to the conference.

The two remaining people who didn't answer return to their offices at 2 and place a call to a WorldWorx number that connects via the FES to the CONVERSANT voice response unit (VRU). The VRU asks for user identification number and password, then with synthesized speech, tells the two to hang up and wait to be added to the conference. It then alerts the MRCS, which directs the MCU to call them and add them to the conference.

During the meeting, Flynn brings up the Microsoft Word[1] Proposal, a PowerPoint[1], and an Excel[1] spreadsheet covering costs. The suppliers edit the shared spreadsheet and all conferees edit the proposal, each in turn, under Flynn's direction. The meeting is set up so that the current speaker is seen by all other participants and each, in turn, sees the previous speaker. After the editing is complete each person saves a copy in his endpoint, the spreadsheet is approved, and the time line is reviewed. Finally at 4:30 from the Maine woods the CEO calls into the VRU, is authenticated by voice prompting and touch-tone response, and connected to the conferees, who are alerted to his joining by the MCU.

The meeting ends on time, although some participants have left early. Call-detail records are completed for each conferee and transmitted to the MRCS, which associates them with the Flynn conference, and passes call and conference billing information to the Billing Rating and Rendering System (BRRS) for inclusion in Flynn's next WorldWorx bill.



BRRS (Billing Rating and Rendering System)—Receives billing information from the MRCS and provides hardware and software to support bill rating and rendering.

CC (Customer Care) Server—Provides hardware and software to support subscription and help desk functions. Retains customer and directory information.

CCC (Customer CareCenter)—Source of professional services such as design, management, operation, installation, maintenance, etc.

FES (Front-End Switch)—Provides interfaces between the AT&T network and the MCUs. Also provides access to the Conversant Voice Response Unit (VRU) and generates call-detail information and transmits it to the MRCS.

MRCS (Meeting Reservation and Control System)—Manages meeting reservations, resource allocation, configuration, setup and control. Gathers usage and billing information.

ipants to see each other at once, in windows of varying sizes. (This capability will depend in part on the work of standards bodies now developing the presentation of multiple images.) There'll also be greater choice of transmission services for corporate users—for example, asynchronous transfer mode (ATM) and Switched Multimegabit Data Service (SMDS).

CONFERENCING SOFTWARE

WorldWorx Personal Conferencing Service works in tandem with collaborative software such as that included in AT&T's Vistium 1200 and 1300 board sets and Share software package, or in ProShare[2] 200 desktop videoconferencing software. The Vistium software, which runs under Windows[1] 3.1 and Workgroup for Windows,[1] includes data capabilities such as:

☐ Application and file-sharing—software that allows one participant on the call to share files and applications software with others.

☐ Annotation—lets participants make notes, comments, or drawings on the shared document.

☐ Confer—an electronic white board on which to brainstorm, diagram...whatever.

☐ Directory—a personal directory, stored in the user's PC, which can be used to initiate calls to the phone numbers or LAN addresses of other users.

☐ File transfer—allows files to be sent to any other participant in a meeting.

PARTNERS

AT&T is partnering in the development of standards and compatible products with several leading software and hardware companies in addition to other business units. Among these companies are Apple Computer, Inc.; Compression Labs, Inc.; DataBeam Corp.; Hewlett-Packard; IBM; InSoft, Inc.; Intel; Lotus Development Corp.; NEC Corp.; PictureTel Corp.; Primavera Systems, Inc.; RSI Systems, Inc; Silicon Graphics, Inc.; Sun Microsystems; Sybase, Inc.; VideoServer; Vivo Software, Inc.; VTEL Corp.; WordPerfect Applications Group, Novell, Inc.; Xerox Corp. and Zydacron, Inc.

Some of the relationships have resulted in development, completed or underway, of products that work as part of a WorldWorx Solution. For example, Sun Microsystems recently announced it will deliver enhanced versions of its ShowMe desktop videoconferencing solution that comply with the H.320 standard and can take advantage of AT&T's new personal conferencing service. Sun further plans to expand its multimedia product line to enable H.320 conferencing applications for its SPARC-based workstations.

LiveWorks, a Xerox company, has developed a shared white board conferencing tool called LiveBoard for interactive sharing of documents. LiveBoard integrates documents such as spreadsheets with a shared workspace on the computer screen.

VideoServer is working with AT&T business units, such as Global Information Solutions, to ensure that its CO 2000 multipoint control unit will support the capabilities planned for WorldWorx services. The system is now being designed to manage interworking between workstations that meet the H.320 standard and those that comply with the Intel Personal Conferencing Specification architecture.

SUPPORT SERVICES

To help users get the most from this new way of doing business, AT&T is offering a variety of support services. The WorldWorx Customer Care Center offers round-the-clock on-line general help, provisioning support, test and turn-up support, directory services, and maintenance. This center is connected to the AT&T Video Center in Atlanta, which offers more specialized assistance, especially for Global Business Video Services customers. And through the Customer Care Center, customers can enlist the help of AT&T's Visual Solutions® Professional Services (based in AT&T's Video Technical Center in Denver) for help with system and network design, project management, application integration, engineering, installation, training, consultation, and on-going maintenance.

The applications for WorldWorx Personal Conferencing Service are really bounded only by imagination and downright necessity. For this service brings video, voice, and data together in a way that fundamentally supports the most human aspects of how we live and work together. It's the sum of its parts—and then some.

1—Microsoft Word, Windows, PowerPoint, Excel and Workgroup for Windows are registered trademarks of Microsoft Corp.

2—ProShare is a trademark of Intel Corp.

GLOBAL VIDEO SERVICES

AT&T WorldWorx Global Business Video Service (GBVS) is the companion to the Personal Conferencing Service. GBVS supports either group video (large conference room) systems, such as AT&T's Group Video Systems, and PCs equipped for video. GBVS operates at 128, 384, or 768 kb/s, and can link sites operating at different rates. At the lower rate, especially, it brings group videoconferencing within reach for small- to medium-sized businesses.

GBVS can link two locations in the same town or dozens of sites around the world, and is currently available from the U.S. to over 20 countries in Europe, Asia, and other parts of the world. It can translate among a variety of transport services, transmission rates, and conferencing equipment from various manufacturers. GBVS can also link up to WorldWorx Personal Conferencing Service at the 128 kb/s rate, so groups can join in meetings with individuals. To enhance video quality, the service uses an inverse multiplexing technique that combines channels for increased bandwidth.

Ernest G. DeNigris

Ernest G. DeNigris is vice president of AT&T WorldWorx Network Services. He supports the team charged with developing and delivering AT&T's new WorldWorx umbrella videoconferencing offering. He's also responsible for AT&T's Global Business Video Service, which provides customers with a comprehensive offering of user-specific videoconferencing solutions. Mr. DeNigris began his AT&T career at AT&T Bell Laboratories. He has a B.S.M.E. from the University of Notre Dame and an M.S.M.E. from the Massachusetts Institute of Technology.

CARL PAVARINI
AT&T

Customers Say: Personal Means More Productive

Four AT&T customers who are using collaborative teleconferencing report increased efficiency and improved client service.

WorldWorx™ Solutions are enabling people in companies and organizations throughout the United States to meet and work together face-to-face across country or just across town.

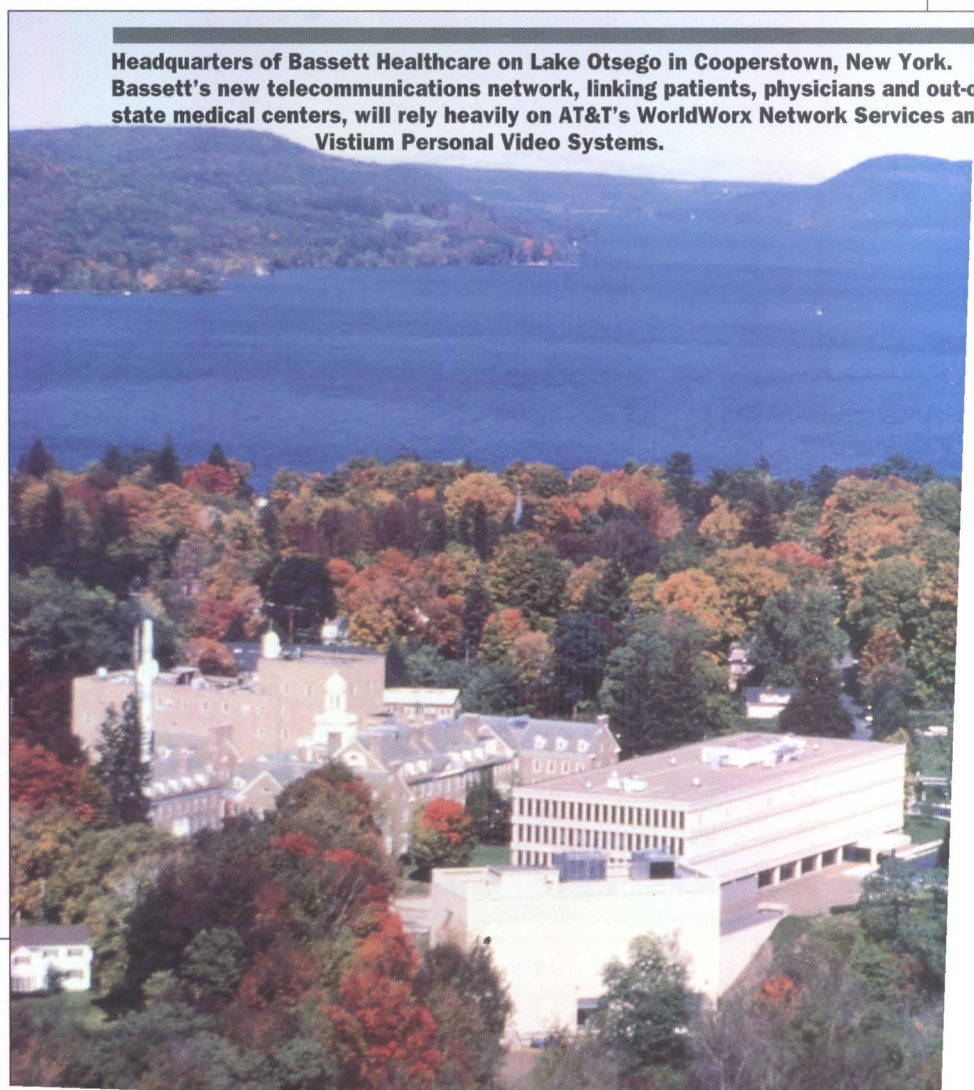
☐ Caterpillar engineers in Illinois resolve warranty questions with a dealer's repair staff in Minnesota and quality issues with colleagues in South Carolina.

☐ Doctors in a Bassett Healthcare clinic in Oneonta, New York, consult with colleagues at Bassett's hub hospital thirty miles north in Cooperstown.

☐ California State University students in Sacramento will handle administrative and financial questions from convenient sites all over campus.

☐ Personnel at Mead Corporation's Dayton, Ohio, headquarters discuss major projects as well as routine workaday matters with co-workers in Paris, Tokyo, and other U.S. locations.

"The closer we can become, the more effective we become, the better we'll be at what we do."



Headquarters of Bassett Healthcare on Lake Otsego in Cooperstown, New York. Bassett's new telecommunications network, linking patients, physicians and out-o state medical centers, will rely heavily on AT&T's WorldWorx Network Services an Vistium Personal Video Systems.

For each organization, these applications are just the beginning. The goals are not just saving costs, but providing better service to customers and making operations generally more efficient.

MULTINATIONAL, MULTIAPPLICATIONS

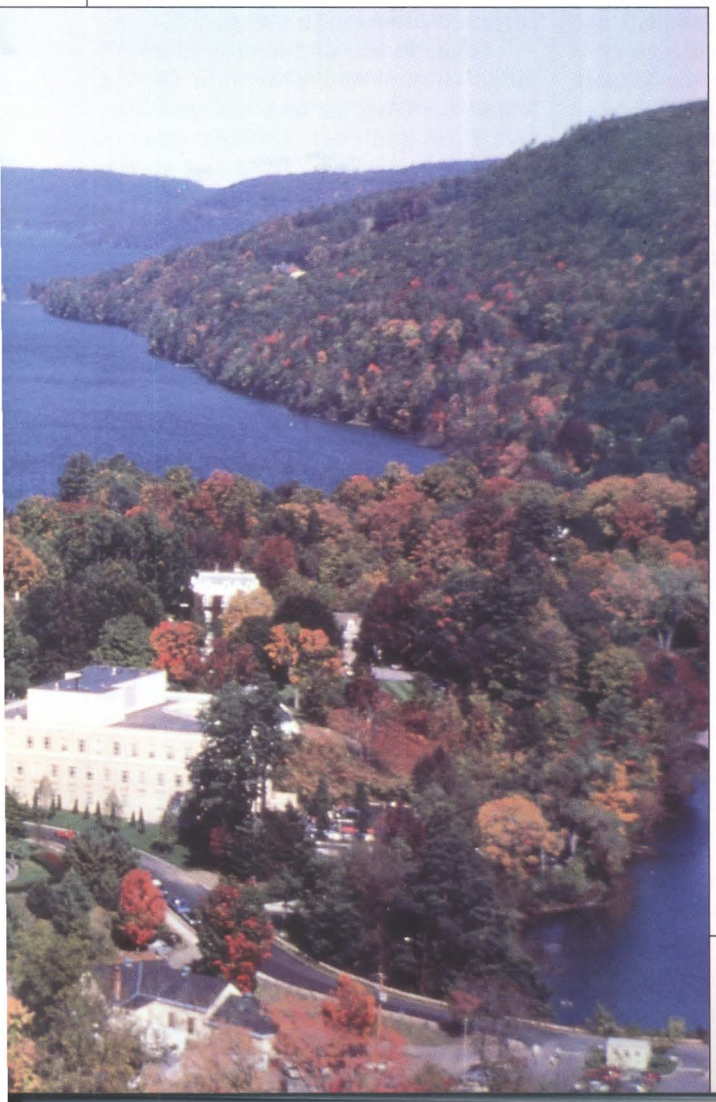
Caterpillar is the world's largest manufacturer of earth-moving and construction equipment and a major manufacturer of diesel and natural-gas engines. Half of its sales are to overseas customers, so, although the company manufactures principally in the United States, it maintains a worldwide network of manufacturing and distribution facilities and marketing offices. It sees a WorldWorx Solution with AT&T's Vistium™ Desktop Videoconferencing Systems as a way to integrate these far-flung operations more tightly for better customer service and an improved bottom line.

"We pride ourselves on being leaders of technology. Vistium Systems will help us enhance our relationships with our dealers, our suppliers, and our customers, as well as internally at Caterpillar," says Kristi Moushon, product manager at the company's Corporate Information Services group.

An engineer in Pontiac can examine a problem part by video rather than have it shipped to Illinois.

One of the company's first Vistium System installations was in its engine division. Engineers at two division locations—Pontiac, Illinois, and Greenville, South Carolina—can now meet face-to-face and work on shared documents with each other and with colleagues at division headquarters in Mossville, Illinois. Pontiac is responsible for quality control at the Greenville plant; the Vistium Systems make monitoring and design collaboration easier.

Caterpillar engineers can also meet with the service staff at a Caterpillar dealership, Ziegler, Inc., in Minneapolis, in a trial to explore whether video communication can bring faster resolution of warranty questions. For example, an engineer in Pontiac can examine a problem part by video, rather than having the service technician describe the problem or ship the part to Illinois. In addition, Vistium Systems in Peoria, Illinois, and Geneva, Switzerland, enable engineering and administrative personnel to meet and collaborate on shared documents.



"When you have facilities located as far away as we do," Moushon says, "the closer we can become, the more effective we become, and the better we'll be at what we do. And the video technology breaks down language and personality barriers."

The multipoint capability, she adds, is "very important for Caterpillar, as a worldwide company that needs to communicate constantly with dealers, suppliers and customers, as well as internally."

A user herself, she reports enjoying the visual interaction, "being able to see the person I'm talking with, and to establish that rapport that is always so much better when you can see the person on the other end of the conversation, rather than just hearing a voice." In the future, Caterpillar intends to explore the possibility of training for dealers on new products.

BETTER RURAL HEALTH CARE

Health care is facing increasing competition as well as other pressures—for example, the need to bring care closer to patients and to extend the knowledge of specialists out from major medical centers to even the most rural areas.

Bassett Healthcare, based in Cooperstown, New York, is a prototype of the new model of health care delivery. It serves ten counties in central New York state with a hub hospital in Cooperstown and sixteen outlying clinics. It also maintains links to medical centers including Columbia Presbyterian in New York City, Dartmouth in Hanover, New Hampshire, and others.

To tie its patients and physicians together and to the medical centers, Bassett is installing a new telecommunications network that will rely in large part on WorldWorx Services and Vistium Systems, as well as an AT&T Group Video System and an AT&T MultiPoint Control Unit (MCU). The program is so innovative that Bassett has won grants of almost $500,000 from the Rural Electrification Administration (REA—part of the United States Department of Agriculture) and over $1 million from the Office of Rural Health Policy (ORHP—part of Health and Human Services) to set up a personal video system and demonstrate its value in telemedicine and other applications. Five applications discussed so far are:

☐ Continuing medical education—physicians in outlying areas can work with colleagues at the hub hospital and at major medical centers. In a pilot program, doctors in the Oneonta clinic join weekly grand rounds transmitted from a lecture room at the Mary Imogene Bassett Hospital in Cooperstown. Currently, transmission is via room-size videoconferencing systems,

but, says Martha Gorman, manager of Bassett's Research Institute, "We'll be using the Vistium Systems to receive grand rounds in our smaller locations." The two-line (112 kilobits per second, combined) service used for video transmission is quite adequate for teleconferencing. Because Bassett will use both room-sized and personal video conferencing units, it's valuable to the organization that locations with group or personal video systems can take part in the same meeting.

☐ Education of medical students at distant sites—students assigned to rural clinics can learn remotely from Bassett's teaching staff, all of whom have appointments at the Columbia University College of Physicians and Surgeons and/or other medical centers.

☐ Consultation by video—patients can visit physicians at the hospital or a distant clinic without driving there. During snowstorms, people will be able to see a doctor at the hospital from a local clinic, via personal video conferencing, so it'll be easier for them to keep appointments and easier to deliver timely medical care.

Doctors can go in the countryside and not lose their skills, and can participate in the education of medical students.

☐ Remote consultations by ancillary medical care providers—patients will be able to visit nutritionists, who tend to be scarce in rural areas, via video. One aid to managing one's diet that needs to be seen: examples of healthy size portions.

☐ Administrative support for rural clinics—the Vistium Systems will let administrators share spreadsheets and other documents during their monthly and weekly meetings.

"The real challenge in rural medicine is to break down the distance barrier," says Dr. Thomas Pearson, scientific director of the Research Institute. Medical education and health care today are based on urban models. By breaking down the distance barrier, AT&T is helping us improve the quality of life in rural areas and reinforce the aesthetically positive features of rural practice. Now, doctors can go in the countryside and not lose their skills. They can also participate in the education of medical students, and have access to specialty consultations as their urban colleagues do."

Adds Gorman, "We looked at different technologies, for example, microwave and satellite. Microwave wouldn't work very well with the hills around here, and satellite was too expensive. So we chose the compressed-video, personal-video technology. Also, the only vendor who responded positively to our plans before we got our grants was AT&T."

The headquarters building of Mead Corporation in Dayton, Ohio. Mead operates forest products and information services businesses.

EDUCATIONAL OUTREACH

Even when distances are much shorter, it's still important to make face-to-face communications easy. That's particularly true for enterprises facing new or increasing competition, as universities are. California State University at Sacramento (CSUS) attracts faculty and some 26,000 students in part with its advanced communications set-up.

Home to one of the most advanced video centers in the western United States, the CSUS campus has an extensive fiber and coax network serving some 400 classrooms, fixed and mobile satellite uplink equipment, four interactive studio classrooms, and two broadcast-quality studios. In addition to its on-campus video programming and distribution, CSUS is one of three major production centers serving the 20-campus Cal State system. CSUS is also a pioneer in distance learning—it's now opening a remote interactive learning center at Solano Community College, some 50 miles away, and is negotiating with additional community colleges to provide video instruction at the upper division level. The CSUS network now includes an AT&T MultiPoint Control Unit to help manage the personal video communications.

"Desktop video is a natural extension of our larger-scale video program," says Allan Hinderstein, assistant director of media technology at CSUS. Many of the 16 Vistium Systems now being installed won't reside on desks, though—they'll be in kiosks placed on and off campus to make it easy for stu-

Mendocino Hall, at California State University in Sacramento, is one of several large classroom-lecture halls and office buildings. Over 95 percent of the campus buildings are equipped to receive audio, video and data from university media services and the campus computer center.

dents to get administrative information about, say, career planning, library services, or financial aid.

"Face-to-face contact is important, given the nature of these discussions," Hinderstein says. "And we want to make access easy for students, so they don't have to go all the way across campus to the administration building. With the AT&T systems, they can call from any of the kiosks and talk to a real person."

In a pilot program, CSUS faculty and staffers are holding face-to-face meetings across campus and across country. For example, Hinderstein says that one group from the theater of environmental studies department met with representatives of the Gertrude Stein Theater in New York City to discuss a special inner-city environmental project.

"We're finding that the personal video meetings move quickly," he says. "The faculty and staff using the technology come to the meeting ready to work. It has a powerful effect on how people spend their time during the meeting. It even encourages participation—we find that the meeting facilitator periodically checks in with all participants, so no-one remains silent."

CSUS is finding the Vistium Systems easy to install and use. "We're pleased at how quickly the system can be configured and brought on-line," Hinderstein says. "It takes a minimum number of keystrokes on our part—it's very user-friendly. During meetings, users have the choice of seeing a full-screen, all-inclusive view of the room used by another group of participants, or a close-up of the individual speaking." CSUS is also trialing software that allows participants to collaborate on shared documents.

CSUS expects to expand its use of personal video. "We're seeing significant changes in the role of the university campus," Hinderstein says. "Personal flexibility is important to students — the ability to pursue their education without a daily presence on campus. That also saves wear and tear on our physical plant. We need outreach, and we believe that personal video will be an important part of it."

GREATER EFFECTIVENESS, WORLDWIDE

Mead Corporation, which operates both forest products and information services businesses, uses group video so its employees can talk face to face. Employees at the company's Dayton, Ohio, headquarters and other domestic and overseas locations are linked by a WorldWorx network of sixteen AT&T Group Video Systems. The goal? Better customer satisfaction. That translates to operating excellence and continuous productivity improvements.

"We're not justifying video conferencing as a way just to cut costs," says Tom Ireland, manager of client services. "We use it because people operate more effectively with personal contact. We also find that video conferencing helps people work together better between business trips."

Mead is now looking at adding personal video to its group video network. One possible application: working with callers on a help line — with collaborative software, the Mead expert could train a caller directly on his or her own PC.

EFFECTIVENESS UNLIMITED

Most businesses have realized that cutting costs alone isn't the route to greater profitability. Improving effectiveness and providing better customer service are, if anything, even more important. The possibilities for WorldWorx Solutions are already obvious and they're endless.

Carl Pavarini

Carl Pavarini is vice president of Emerging Markets for AT&T Global Business Communications Systems in Basking Ridge, N.J. He and his team are responsible for the ongoing development of GBCS's strategic roadmap for multimedia, and for the support of many emerging-offers market groups. Mr. Pavarini joined AT&T in 1973. He holds B.S. and M.S. degrees in electrical engineering and a Ph.D. degree in systems engineering, all from Rensselaer Polytechnic Institute.

MARK J. KOENIG
MARTIN J. WELT
AT&T

MCUs Help Take The Worry Out of Being There

AT&T's Multipoint Control Unit enables organizations to save time and money through multipoint videoconferences.

The AT&T MCU allows videoconferencing of up to 24 locations — or 46 in a cascade.

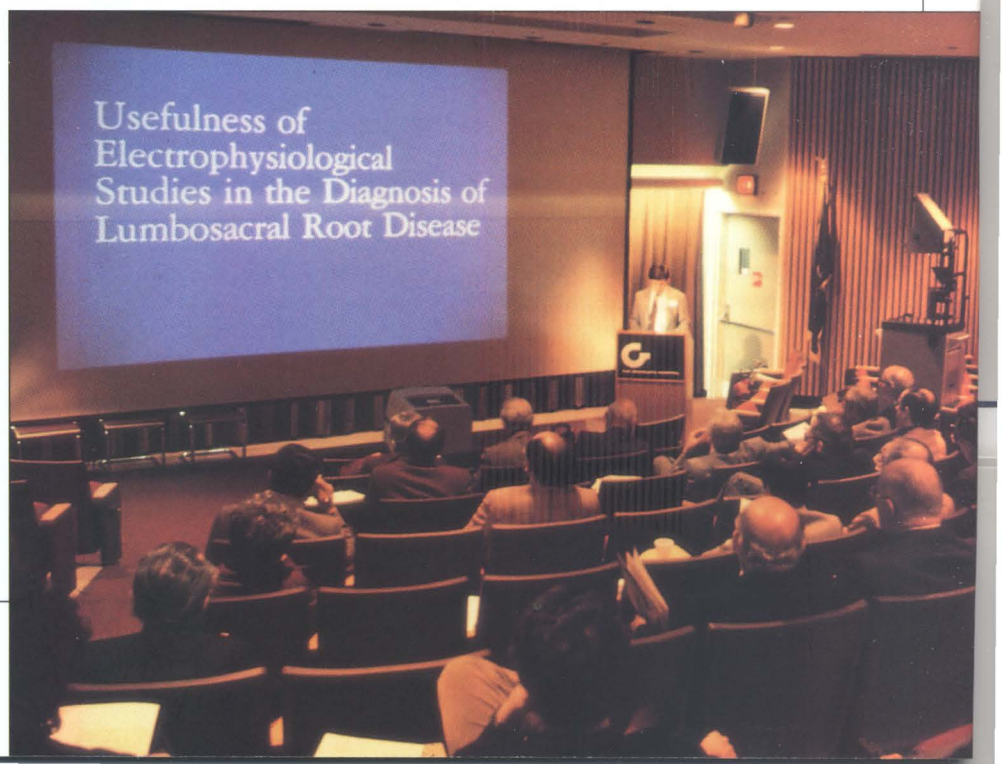
Non-stop. Reservations. Express. Just the words you want to hear in connection with your business trip. They suggest you can bypass the normal stops and check points to get where you're going and accomplish what you must quickly and with few complications.

Still, such a trip is not without its drawbacks. It's physically exhausting. It requires you to spend valuable time out of the office. And it's expensive—which means it's probable that, to conserve financial resources, your company will send you on the trip alone, expecting you not only to cover your own area of expertise, but to fill in for your absent associates and update them upon returning. The ability to eliminate disadvantages such as these can benefit businesses and other organizations enormously.

GRADUATE GRADUATES

Take Graduate Health System (GHS), for example. With eight sites located in the Philadelphia metropolitan area, GHS was trying to solve two business problems. It needed to enable its physicians to participate in continuing medical education without having to travel to one of two teaching institutions in the system. And it needed to improve communications between all of its component institutions, so as to take advantage of their individual strengths.

Working with their AT&T account team, GHS purchased eight Group Video Systems to enable groups of its physicians and other employees to confer visually as well as orally across locations. The Group Video Systems were linked by an AT&T MultiPoint Control Unit (MCU), which allows videoconferencing of up to 24 locations (or 46 locations in a cascade), with an AT&T



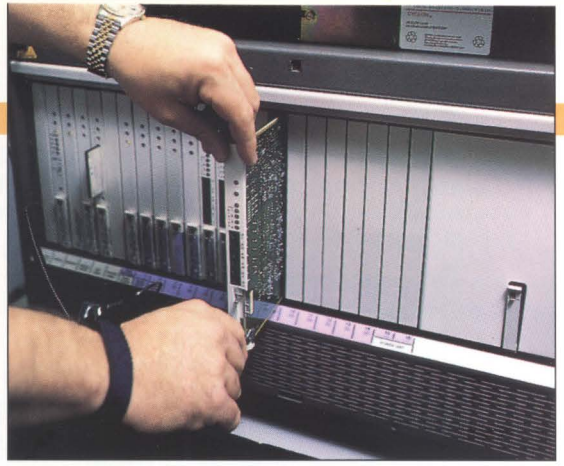
Conference Reservation System (CRS), which is used for determining the availability of conference rooms, setting up reservations and controlling the AT&T MCU. As conferences were expected to be lengthy and frequent, GHS purchased the MCU and the CRS. This saved conferencing costs and enabled GHS's personnel to administer the conference schedule on site.

Since GHS's MCU purchase approximately a year ago, conferences covering such professional education subjects as medical grand rounds, cardiology rounds, gynecology, medical ethics, clinical pharmacy, and radiology have averaged 15 to 20 a month. Administrative committee conferences, held monthly, have dealt with such matters as contract reviews, geriatric services and patient accounting. To date, there have been over 200 multipoint conferences at GHS, usually involving four to six locations. Seventy-five percent of these conferences have involved physician continuing education.

To examine the benefits of multipoint videoconferencing, GHS assumes the avoidance of 2 hours of round-trip travel per doctor and 10 doctors per course. In the first nine months, there have been about 150 courses for doctors, which would equate to an annual savings of 4,000 hours. While this cannot be tied to an expense reduction for GHS, it is directly linked to improving the quality of medical care by making it more convenient for physicians to participate in continuing education programs and giving them more time to spend on patient care.

GHS's decision to purchase an MCU for its private network rather than use a public network-based service was based primarily on economics. With the cost of a network-based service expected to be $150 per hour for each 384-kb/s video location, the break-even point for the purchase was less then 700 endpoint hours. At GHS's current usage rate of over 100 endpoint hours per month, the investment is justified well within a year.

AT&T's Multipoint Control Unit enables doctors at the various GHS sites to participate in professional sessions such as this one via videoconference, eliminating the disadvantages associated with travel.



Flexible and modular, AT&T's Multipoint Control Unit makes it easy to add capacity and features without major equipment upgrades.

HOW AN MCU WORKS

The term *multipoint control unit* was standardized by the International Telegraph and Telephone Consultative Committee, now known as the International Telecommunications Union (ITU). The MCU embodies a set of voice, video and data bridging functions that conform to a set of internationally recognized standards, so that video coders/decoders (codecs) from any vendor as well as bridges from any vendor can work together.

In the same way that long-established audio conferencing bridges allow anyone with a standard analog telephone anywhere in the world to call in to a multipoint audio conference and communicate with others in a pre-reserved conference, MCUs allow users with video codecs conforming to the Px64 H-series recommendations for video and G-series recommendations for audio to call in to multipoint conferences involving audio and video. (When endpoints and MCUs also conform to the recently baselined T-series standards, the multimedia conference will extend to multipoint collaborative data capabilities.)

Basically, the MCU synchronizes the multiplexed voice, video, data and control streams from each endpoint, ensures a compatible set of audio and video parameters for the conference from the options communicated by the control sequences from the endpoints, and then decodes and sums the audio streams from all parties for broadcast to the participants.

The video seen by the participants is determined by a variety of methods that have been pre-reserved for the conference or that are controlled by the conference chairperson. One common method is voice-activated switching. In this mode, some MCUs let the image of the loudest speaker be seen by the other conferees while the loudest speaker's location sees the previous speaker's location.

The AT&T MCU uses a more sophisticated algorithm for determining voice activation: switching from the current speaker's location doesn't occur until that speaker stops talking; then the first speaker who's still speaking after a minimal guard interval is seen by the other conferees. This avoids the disturbing ping-pong effect of switching prematurely on room noises or short voice interruptions and also the need for conferees who aren't speaking to mute their microphones and then unmute them before speaking.

Other AT&T MCU video switching methods include presentation and auto-scan modes. In presentation mode, the presenter designated at reservation time is seen by all other parties, while the presenter sees any location asking a question. In auto-scan mode, as in presentation mode, the presenter is seen by all other parties; however, the presenter sees all other locations in sequence scanned at a rate determined in the reservation. The AT&T MCU also supports H-series standardized chair control, in which one endpoint—designated as chair in the reservation—controls who's seen by using a standard set of in-band control codes.

Conferees can be connected to an MCU conference in three ways:

- ☐ Meet-Me: Conferees dial a pre-assigned number; they have the option of a password for security.
- ☐ Dial-Out: The MCU calls the conferees.
- ☐ Combination: The MCU calls the conferees, who are connected after giving the password.

The AT&T MCU supports a variety of endpoint transmission rates from 2 bearer channels (112 kilobits per second, or kb/s, on restricted facilities, 128 kb/s on ISDN facilities) to 24 bearer channels (1,536 kb/s). And it supports simultaneous conferences at different rates, with

New Products, Systems and Services

MANAGING PAPER ELECTRONICALLY

AT&T EasyLink Services® and Visioneer Inc. have teamed to solve the common problem of how to share paper-based information quickly and easily with those who need it. The solution integrates Visioneer's scanning hardware and software with global messaging services from AT&T EasyLink so users can convert paper documents to electronic form and send them right from their PCs to electronic addresses or fax machines in some 160 countries.

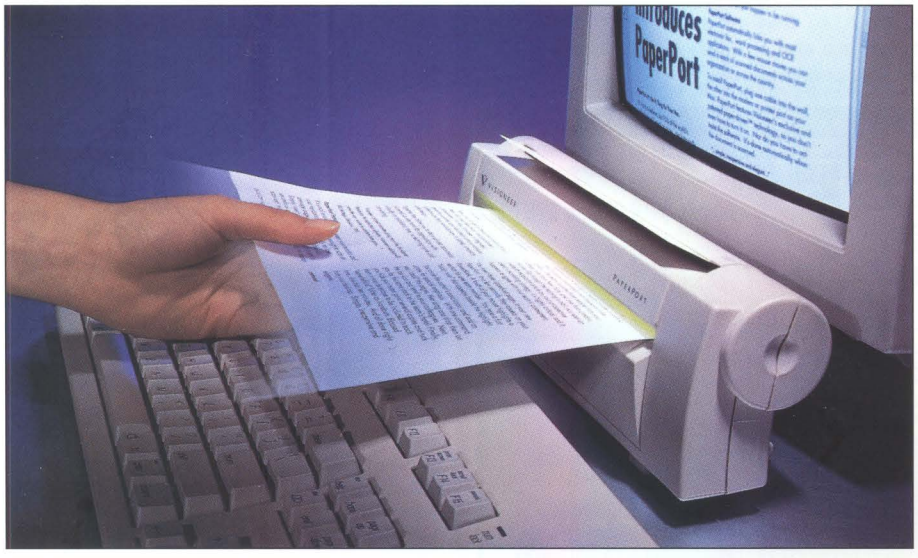
Scanned documents could include newspaper or magazine articles, receipts, canceled checks, and forms such as purchase orders, trade show registrations or subscriptions. Once converted, they can be combined with documents created through word processing, spreadsheet and other kinds of programs.

Three integrated components make paper management electronic: The Visioneer PaperMax[1] is a compact paper-scanner that scans a typical page in six seconds and fits conveniently between a PC's keyboard and monitor. It weighs 2.5 pounds, and is 3 inches deep, 3 3/4 inches wide and 12 1/2 inches long. PaperMax connects to a computer's serial port.

MaxMate[1], the cross-platform software integrated with PaperMax, performs document handling, including the ability to zoom and rotate images, do highlighter and "sticky note" functions, and retrieve documents by searching on key words.

AT&T Mail, the electronic mail service of AT&T EasyLink Services, provides connectivity to more than 40 email systems around the world. MaxMate users can click and drag their electronic documents to an AT&T Mail screen icon that prepares them for routing over the AT&T EasyLink network. The network can send messages to email addresses or directly to fax machines and can provide secure fax mailboxes and fax broadcasting capabilities.

The suggested retail price of PaperMax and MaxMate for Windows[2] is $449. Charges for AT&T Mail are based on the number of information characters a user sends.



Feeding a page into the Visioneer PaperMax scanner, the user will be able in a matter of seconds to transmit or process the information now that it's in electronic form. All without leaving the desk.

VENTURE WILL SERVE EUROPE-BASED COMPANIES

AT&T and Unisource have formed a company that will combine their data and business voice services in Europe. Unisource is a pan-European telecommunications service provider founded in 1992 as a joint venture of PTT Telecom Netherlands, Sweden's Telia, and Swiss Telecom PTT.

The new company will focus primarily on providing communications services to multinational companies operating in Europe, and will offer customers improved access to North America and the Asia/Pacific region.

Unisource will merge its business networks, satellite, and voice services divisions with the AT&T Business Communications Services Europe and AT&T EasyLink Services groups in creating the venture. Under the terms of an agreement in principle, Unisource will own 60 percent and AT&T will own 40 percent. The new company will have assets of approximately $200 million and a customer base that includes some 300 of the world's leading multinational companies. Its more than 2,000 employees will come from from 17 countries and will include a significant number from Spain's Telefonica, which is in the process of joining Unisource as a fourth and equal shareholder.

Unisource and AT&T have been working closely in Europe since April 1994 when a joint bid by the two companies was selected for provisioning voice

services to the European Virtual Private Network Users Association, a group of some 30 leading multinational companies in Europe. The relationship was further strengthened when Unisource joined the WorldPartners℠ association of global telecommunications carriers formed in mid-1993 by AT&T, KDD of Japan, and Singapore Telecom. WorldPartners offers seamless voice and data services, including private line, frame relay, and virtual network services, that provide global connectivity to multinational companies in the world's major markets.

The name and headquarters location of the new company are expected to be announced soon; and full operation is expected by mid-1995, subject to regulatory approval by the European Union Authorities. Some services are available now as a result of earlier cooperative efforts by AT&T and Unisource on closed user-group voice services and in the WorldPartners association.

GUANGDONG TO RECEIVE AT&T NETWORK EQUIPMENT

AT&T will supply advanced telecommunications infrastructure equipment to Guangdong Province in Southern China under a contract with the Guangdong Province Posts and Telecommunications Administrative Bureau (GPTB) for more than $150 million.

Under the terms of the contract, AT&T Network Systems will supply the GPTB with the most advanced, commercially available network infrastructure equipment. This includes several AT&T 5ESS®-2000 switches for local and toll exchanges, ultra-high-speed synchronous digital hierarchy (SDH) transmission systems, digital cross-connect systems, operations systems, premises distribution systems, optical fiber cable and other related equipment. The contract is the first phase of a $500 million cooperation and purchase agreement announced last September.

Installation of the network infrastructure equipment is scheduled for completion by mid-1995. New services, such as 800-toll-free services, high-speed data and image transmission, and virtual private networks, will then be available through GPTB to business and residential customers. AT&T will supply, supervise the installation of, test and commission the equipment necessary to implement this new network.

AT&T currently has eight joint ventures in China and offices in six cities—Beijing, Shanghai, Guangzhou, Chengdu, Wuhan and Shenyang. AT&T's activities in China are coordinated by AT&T China Inc.

"FOLLOW-ME" NUMBERS KEEP USERS IN TOUCH

Mobile consumers and corporate road warriors eager for the new 500-prefix "follow-me-everywhere" numbers are getting them from AT&T, the first company to offer a service. Subscribers to the personal number service, called AT&T True Connections,℠ each have their own 500-prefix number that can be programmed to ring any telephone, cellular phone, pager, fax machine or personal computer that can be dialed directly in the U.S. and more than 200 other countries. Subscribers can tailor the service to their needs and keep their 500 number for life. Anyone who needs to stay connected to business associates, friends or relatives while moving from place to place can benefit from having an AT&T 500 number.

AT&T True Connections offers several 500-number packages:

☐ "Private Line" is the basic package that gives subscribers a personal 500-prefix number that will always ring at their home phone, no matter how often they move within the U.S. They can also use the number when placing calls to their own homes from elsewhere. And beginning in February 1995, they'll be able to charge calls to other places on their AT&T True Connections accounts without coins or credit cards.

☐ The "Stay Close" package adds call-placing and the subscriber's choice of call forwarding or reverse-billing to the basic package. Call forwarding lets the subscriber have 500-number calls forwarded to virtually any other U.S. telephone and to more than 200 countries and areas on demand. Reverse-billing lets the subscriber pay for calls from other people who have a code number given by the subscriber.

☐ The "Traveler" package adds call-placing, call-forwarding and reverse-billing to the basic package.

☐ "Navigator," the premium package, includes all the above features and adds call-sequencing, which lets a subscriber's 500-number calls ring at several locations in sequence. For example, a call could be forwarded first to an office phone, then a cellular phone, then a home phone. The subscriber can change the sequence as often as desired.

☐ The business package includes all the features available to consumers plus business-related enhancements that will be added in coming months.

Voice mail, with no limit on the number of messages subscribers can receive, can be added to any of the packages. Its features include call screening and pager notification.

For consumers to subscribe to AT&T True Connections, they must have or obtain AT&T long-distance service in their homes but need not enroll in any specific plan. For more information about AT&T True Connections for business customers or consumers, call 1-800-TRUE-500.

BUILDING APPLICATIONS FOR AT&T'S NEW PUBLIC DATA NETWORK

AT&T is offering a comprehensive Application Developer Program that will help independent software developers build business applications for AT&T's new public data network which the company announced in the spring of 1994. AT&T is building the applications hosting environment with its business partners, Novell, Inc., and Lotus Development Corp. Two other services already announced for the new data network are AT&T NetWare Connect[3] Services and AT&T Network Notes[4].

The Application Developer Program includes programming guidelines, technical expertise, training and marketing resources. A key resource will be the Application Development Centers, which will help developers create and test applications and certify performance. Slated to open in the first quarter of 1995, the centers will offer software testing, an applications show-

continued on page 22

ROBERT M. HOWE III
AT&T

Vistium Products Give Another Point of View

AT&T's Vistium products are equipping PCs such as the AT&T Globalyst to bring videoconferencing to users' desktops.

Active, collaborative computing and communication is the latest tool in project management, with video adding the personal touch.

AT&T, which introduced the world's first videoconferencing product at the 1964 New York World's Fair, continues to play a leading role in the teleconferencing industry. While AT&T Bell Laboratories and AT&T Microelectronics are at the cutting edge developing new algorithms and semiconductor chips for crucial audio and video compression, AT&T Global Information Solutions (GIS), AT&T Global Business Communications Systems and AT&T Business Communications Services are packaging that technology into products and services of immediate benefit to customers. And when those products and services put videoconferencing at users' fingertips, PCs become multimedia workstations for personal computing and communications.

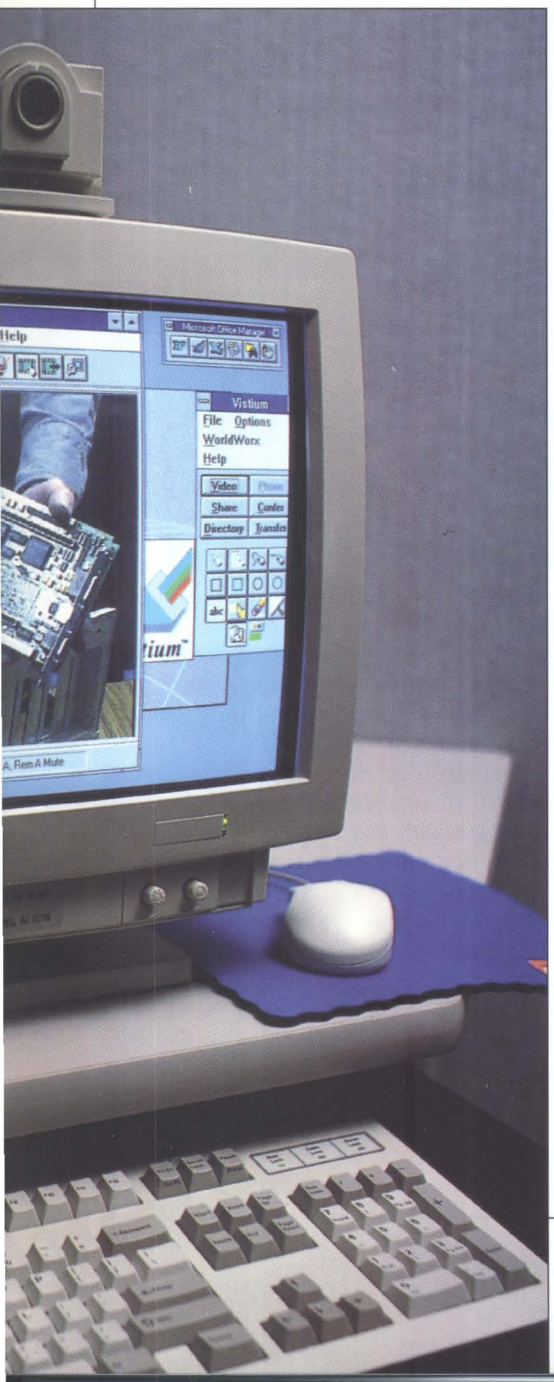
FROM CONFERENCE ROOM TO DESKTOP

During 1993, AT&T Microelectronics' advances in compression and digital-signal-processor technology made it possible for AT&T GIS and other vendors to integrate videoconferencing capabilities into PCs. AT&T GIS knew that videoconferencing, like that offered by the Group Video Systems that were becoming commonplace in boardrooms and conference rooms around the globe, would reduce the costs and other disadvantages of travel and improve workgroup collaboration and productivity. It also knew that with videoconferencing taking place at the desktop, where people are empowered to work differently from the way they work in conference rooms, different applications and opportunities would be available to users of the technology.

The initial product, introduced in March 1993 as the Telemedia product line and since renamed Vistium™ Personal Video (PV) 1300, is a two-board set that turns an industry-standard-

architecture (ISA)-bus computer, such as a 386 or a 486, into a full desktop videoconferencing workstation. Complete Vistium turnkey solutions are available on a configure-to-order basis in various AT&T Globalyst™ PCs right from the factory or value-added reseller.

The superior video quality, adherence to international standards and easy-to-use software of the Vistium system earned it the coveted Editors' Choice Award from PC Magazine in June 1994 as a turnkey solution, and again in October as a system platform. Specifically cited for recognition were the system's industry-first application-sharing paradigm—a user interface that matches the way people really work—and its high-quality audio and video signals.



Displayed on the screen of an AT&T Globalyst PC is a AT&T Vistium model PV 1300 board. PV stands for personal video, which describes what PCs become with Vistium hardware and software products expanding their capabilities.

A Vistium-equipped Globalyst system includes innovative software that supports full application-sharing, and an on-screen whiteboard for collaborative document-conferencing. Other functions include call management, auto dialing and file-transfer utilities. These allow users to place calls automatically from their customized directories and to transfer files to other users while talking to them by merely pressing a key.

The Vistium PV 1300 set of boards broke through the $6,000 floor for a videoconferencing solution with high-quality audio and a full-duplex, echo-cancellation speakerphone. At the same time, it was the industry's first fully H.320-compliant desktop solution. (See sidebar on page 20.) Older videoconferencing technologies, based on proprietary coders/decoders (codecs), could communicate only with products from the same vendor. However, H.320 compatibility guarantees AT&T customers cross-platform, cross-vendor interoperability as well as the benefits of future H.320 silicon advances.

In June 1994, AT&T introduced the second-generation Vistium product—the Vistium PV 1200. This is a single ISA-bus board that packs a video encoder and a high-quality audio system and uses virtually any ISDN basic rate interface line or V.35 lines for transmission speeds of 112 kilobits per second (kb/s) and 128 kb/s. With a new design by AT&T GIS and second-generation chips from AT&T Microelectronics, the Vistium PV 1200 is nearly 50 percent less costly than the first-generation Vistium PV 1300 system. And, like the earlier system, the Vistium PV 1200 is an industry first. Recommended for newer, more powerful PCs using Pentium[1] and i486[1], 66-megahertz processors, it's the first commercial product to be based on H.320 video decoding in software.

AT&T is also marketing with Globalyst systems the 8510 ISDN telephone and two charge-coupled-device color cameras optimized for the desktop, one of which has autofocus and locally controlled pan, tilt and zoom. By mid-1995, camera control capabilities will reside at either end of the call.

IT'S IN THE CHIPS

The heart of the Vistium-equipped Globalyst videoconferencing system is the AVP video processor. The AVP is a three-chip product designed specifically for low-cost, high-quality videoconferencing systems that comply with the H.320 standards of the International Telecommunications Union (formerly the CCITT). The chip set consists of a video encoder, a video decoder and a system controller, which handles communication protocols, audio/video synchronization, framing, and dynamic bandwidth allocation.

The AVP set allows designers to optimize around particular price/performance points. For example, the Vistium PV 1300 uses all three chips, while the Vistium PV 1200 doesn't use the decoder chip. It opts instead for software decoding in the PC, which results in higher image resolution and increased flexibility as well as lower cost.

The second-generation AVP chips are about 30 percent less costly and are in smaller packages than the first-generation chips. The AVP4310A encoder has ten major on-board functional blocks and a peak performance rating of about 4 billion operations per second. The chip can compress up to 30 full-motion video frames per second (f/s) at quarter-common intermediate format (QCIF)—144 lines x 176 pixels—and up to 20 f/s at full CIF—288 x 352 pixels. Encoder performance is one of the key driving factors in videoconferencing performance, and the AVP chipset provides users with superior images across a range of operating conditions (movement of objects in front of the camera) from 21 kb/s to 2 megabits per second.

The encoder has the power to execute a frame-to-frame full-pixel-search motion-estimation technique. By discounting the redundancies both within frames and between frames, the encoder reduces the volume of data requiring compression. Most H.261 full-motion encoders lack the AVP's horsepower and, therefore, use less compute-

The H.320 Standard

H.320 is an international standard for videoconferencing originating from the International Telecommunications Union (formerly the CCITT). H.320 itself is an umbrella specification that encompasses a variety of standards for audio compression, video compression and telephone call set-up and control (see table). H.320 began as the focus of the international Px64 committee and is still commonly called Px64 today.

H.320 promises to do for videoconferencing what CCITT Group 3 did for fax and the V-series standards did for modem communications: eliminate concern for hardware details and make communications spontaneous and universal—no different from an analog voice call. Standards also make it economically feasible for vendors to put functions into chips, speeding up performance, shrinking system packaging and lowering overall system costs. Codec chips are one of the primary factors in bringing videoconferencing systems to the desktop. AT&T's AVP chip set, introduced in 1992, is the industry's first full H.320-compliant chip. Its support is both wide and deep, especially outside the United States.

H.320 is not standing still. The international committee is studying an expanded scope of standards to include multipoint calls (T.120), computer graphics (T.120) and low-bit-rate telephony for videoconferencing over analog lines (H.32P).

Videoconferencing Standards Included Under H.320

Specification	*Function*
H.221	Communication framing, demultiplexing/multiplexing
H.230	Control and information signals
H.242	Call setup/disconnect: point-to-point
H.243	Call setup/disconnect: multipoint
H.261	Full-motion video coding
G.711	3.1-kHz pulse-code-modulation (PCM) audio, 64 kb/s
G.721/3	Multirate adaptive-delta pulse-code-modulation (ADPCM) audio
G.722	7-kHz audio, 48- or 56-kb/s
G.726	Multirate ADPCM audio
G.728	16-kb/s low-delay code-exited-linear-predictive (CELP) speech, 3,400-Hz audio

intensive techniques. With Vistium solutions on Globalyst platforms, customers benefit by having higher quality video and shorter transmission latencies, which improves audio/video synchronization and makes full-duplex communications much easier.

At the receiving end, the AVP decoder chip reverses the encoding process. The AVP system controller, which connects to the video and audio codec units via serial I/O lines, multiplexes and demultiplexes video, audio, user data and control signals into a single bit stream using the H.221 standard. It also supports framing signaling and control (H.221, H.230, H.242) between communicating endpoints.

AT&T's DSP3210 multimedia signal processor and the visible caching operating system handle audio compression/decompression on the Vistium boards, as well as echo cancellation and full-duplex speakerphone capabilities. The DSP3210 is also capable of handling a variety of other multimedia tasks, including speech and audio routines, fax and data modulations, and still-image compression.

VISTIUM PRODUCTS GO POTS, TOO

Customers who don't have access to switched digital service or who don't need video capabilities still may have multimedia conferencing requirements. Vistium Share Software is AT&T's application-sharing software for desktop-to-desktop collaboration over local-area networks or standard analog phone lines. Vistium Share represents a new class of PC software called data conferencing. Think of it as desktop videoconferencing without the video. The hardware needed for data conferencing is low in cost and, what's more, it works on the ubiquitous analog line used by plain old telephone service (POTS), as well as on a LAN.

AT&T has developed a technology demo of a collaborative workboard (CWB), which represents the new generation of multimedia modems—single add-in boards that combine fax, data and voice communications on a single POTS line. This technology uses AT&T's general purpose DSP3210 chip to digitize voice and combine it with other data into a unified data stream. AT&T demonstrated that the CWB could enable users to share files as they talk over a single POTS line, with data traveling at over 12K baud. AT&T is looking to incorporate this technology into future PC and

communications solutions.

Most of the products currently available require two separate phone lines—one for voice, one for data. The emerging data-conferencing solutions, however, are based either on voice-over-data modems such as AT&T Paradyne's Data Port 2001, which mixes analog voice and digital data on a single line, or on all-digital voice-coding technology. These solutions will enable voice and data conferences on one POTS line. Users will be able to conference from their laptops or even car phones, eliminating fax, voice mail, and telephone-tag delays. Both techniques will be supported by Vistium Share software.

WORLDWORX SOLUTIONS CAN BRING IT ALL TOGETHER

Vistium personal video products are members of AT&T's family of WorldWorx™ Solutions. WorldWorx℠ Network Services are the networking glue that allows people at locations all over the world to see, hear, and work with one another while sharing desktop files and data. WorldWorx Network Services support point-to-point and multiparty videoconference calls, linking users of both desktop and group videoconferencing systems with voice and data conferencing solutions from a multitude of vendors. It's a major step toward "multimedia dial tone" services on demand. AT&T's goal is to make future point-to-point and multipoint videoconferencing and data conferencing connections as spontaneous and as easy as today's voice calls.

APPLICATIONS GALORE

While universal videoconferencing is still a few years away, smart customers are finding that the new price/performance reality offers important benefits today. The list of videoconferencing applications is nearly endless, but the most common are in distance learning and project management. (See article on page 8). AT&T Globalyst customers in a wide range of industries from healthcare, insurance and retail to high tech and financial services are finding that videoconferencing is a cost-effective method to deliver continuing education services for physicians, certified life underwriters or sales representatives. And universities can extend their curricula to students deterred by cost or mobility problems from attending in person.

Active, collaborative computing and communications is the latest tool in project management. Companies in a wide range of fields including aerospace, computer science, education, electronics and automobile design are finding that distributed engineering teams can cut valuable months from product development schedules by meeting more frequently and sharing PC-based design and documentation files in an interactive environment. Video adds the personal touch—and for one-on-one conferences, Vistium-equipped Globalyst PCs make desktop videoconferencing an efficient meeting medium.

Applications for videoconferencing are growing as the technology spreads to the desktop. Remote expert consultation/customer services is a prime example. Face-to-face communications with customers can expedite problem-solving sessions and speed technical support calls, while leaving the customer with a higher level of satisfaction.

But the next level of benefits and applications is just beginning to appear as videoconferencing makes possible totally new products and services. Examples include videokiosks for making selections ranging from pharmaceuticals to computers to vacation travel plans; automated teller machines for face-to-face interaction between customers and mortgage/financial services experts; and heavy-duty factory machinery with built-in videoconferencing equipment for on-site diagnostics and expert consultation. Because the costs of videoconferencing have dropped dramatically, and because the technology is riding the PC technology wave, smart companies are making networked video a strategic part of their business.

1—Pentium and i486 are trademarks of Intel Corp.

Robert M. Howe III

Robert M. Howe III is vice president of Worldwide PC Marketing for AT&T Global Information Solutions in Dayton, Ohio. He is responsible for worldwide marketing of the family of AT&T Globalyst PCs and for establishing AT&T GIS as the leading provider of integrated personal computing and communications solutions. Mr. Howe joined AT&T in 1994. He has a B.A. in English from Birmingham-Southern College.

New Products, Systems and Services

continued from page 17

case for customers, network simulations and remote 24-hour access.

AT&T's new public data network will be a broad-based network environment with connectivity based on TCP/IP (transmission control protocol / internet protocol) and the IPX internet protocol. It will provide applications hosting, messaging capabilities and information distribution, and will offer businesses and their customers the benefits of security, reliability, a rich feature set and the flexibility to create applications that stimulate electronic commerce. The connectivity of AT&T's open data platform will extend the reach of applications across company boundaries to include customers, suppliers and other business partners.

Because AT&T will handle the networking, administration and maintenance, support functions are greatly simplified for developers. This reduces the sales cycle and creates new opportunities to market to small and mid-size companies that might otherwise be too costly for developers to serve.

AT&T network capabilities such as directory listings, security features and messaging gateways, will be available to enhance applications. Also, AT&T will provide help-desk and customer-service features.

Criteria established for network integration and network compliance testing will ensure that applications offered through AT&T's public data network are technically rigorous and deliver added value. There will be four levels, each defined by the degree to which applications use the capabilities of the data network. Each level of service will have a commensurate level of support and product certification.

AT&T will provide application programming interfaces so that applications are fully compatible with AT&T's public data network. Additional support will be provided through a Developers' Voice Hotline, AT&T Faxback of development documentation, AT&T Network Notes, the Data Services Developers Database and access to the Application Development Centers. Direct marketing support will include catalog and directory listings, sales and marketing seminars, lead referrals, newsletters and service-enhancement updates. The program complements the Novell and Lotus application developer programs.

UNDERSEA CABLE WILL LINK THREE CONTINENTS

FLAG Limited, an investor consortium, has awarded AT&T Submarine Systems Inc. (AT&T-SSI) the major share of a $1.2 billion contract to construct the world's longest submarine cable system. FLAG stands for Fiber-optic Link Around the Globe. The 27,300-kilometer (17,000-mile) cable will connect Europe, Africa and Asia, with landing points in 11 countries: United Kingdom, Spain, Italy, Egypt, the United Arab Emirates, India, Thailand, Malaysia, Hong Kong, Korea and Japan.

The FLAG consortium consists of NYNEX Network Systems of the U.S., the Dallah Al Baraka Group of Saudi Arabia, Marubeni Corporation of Japan and others. It is the first private investor consortium to invest in an undersea fiber-optic cable. Traditionally, such systems are planned and built by a consortium of carriers, based on a traffic and capacity forecast.

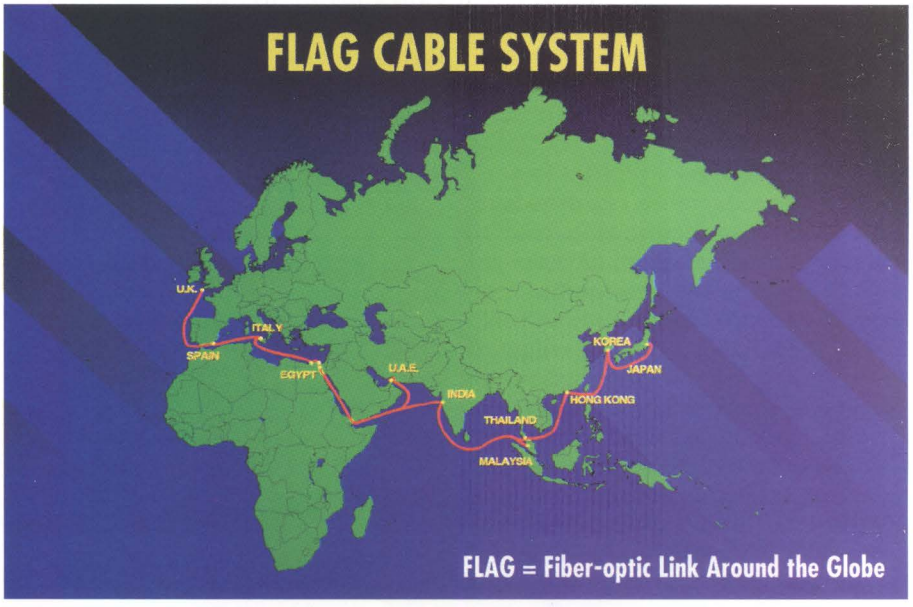
AT&T-SSI will use five ships for laying the cable and take 14 months to complete the job. It is their largest single cable-installation project. In past projects to date, SSI has provided enough cable to circle Earth's equator six times.

ENCRYPTION ADDS VALUE TO VENDOR SERVICES

AT&T Bell Laboratories has developed a comprehensive security system for all types of commercial information services. The AT&T Information Vending Encryption System (IVES) is designed to protect such services as video-on-demand, home shopping and banking, software distribution, electronic publishing, and electronic news and alerting services.

The system works on communications networks of all sorts, including the Internet and other data networks, cable television networks and direct satellite broadcasting. It uses chips jointly designed by Bell Laboratories and VLSI Technologies Inc., a producer of chip sets for personal computers.

The first application of IVES is in set-top cable television boxes being built by AT&T as part of an end-to-end digital video solution for Cablevision Systems Corp. Cablevision, the nation's



fifth largest cable service provider, plans to reach significant numbers of subscribers with enhanced pay-per-view and video-on-demand services this year. IVES will provide assurance that only paying customers receive the services.

The IVES system uses highly secure cryptographic addressing based on security technology licensed from RSA Data Security Inc. Customers and network nodes have unique public cryptographic addresses ensuring that information can be accessed only by those for whom it was intended. The system provides encryption of information for both communications and storage.

IVES provides automated key management, requires minimal bandwidth, and has a straightforward security applications interface. With it, information can be safely and conveniently stored anywhere in a network, public or private.

In addition to being versatile, IVES is a very cost effective security solution because the capability is designed into the system from the beginning. In addition, the security circuitry is efficiently designed into a general-purpose communications controller. The chips perform non-security applications including data and audio compression and communications protocols. Future IVES chips will allow the integration of communications functions, such as modems, on the same chip.

IVES is available now for use in a wide variety of applications. Assistance from Bell Laboratories is available to customize IVES for specific customer applications.

DELTA CHOOSES AT&T'S NETWORK SERVICES

Delta Air Lines has signed a 5-year, $230 million contract with AT&T for worldwide, long-distance voice and data communications services. The new contract, an extension of Delta's current agreement with AT&T for Virtual Telecommunications Network Services (VTNS), will help Delta meet important customer service and cost-reduction objectives. VTNS is a custom-designed integrated voice and data service.

With the new contract, Delta will use cost-effective technologies such as call-prompting to cut the time customers wait for reservations or other assistance. Delta expects that responding to customer's calls more quickly will generate additional sales. The net result for Delta is three-fold: enhanced customer service, the potential for incremental revenue, and significant cost reduction.

The agreement is separate from TransQuest Information Solutions, the newly formed information technology joint venture owned by Delta and AT&T.

1—PaperMax and MaxMate are registered trademarks of Visioneer, Inc.

2—Windows is a trademark of Microsoft Corp.

3—NetWare Connect is a trademark of Novell, Inc., used by AT&T Corp. under license from Novell, Inc.

4—Network Notes is a trademark of Lotus Development Corp. licensed to AT&T.

NEW PRESIDENT TO LEAD BELL LABORATORIES

Daniel C. Stanzione, a veteran software scientist who heads the Global Public Networks business unit of AT&T's Network Systems Group, will assume leadership of AT&T Bell Laboratories March 1 as the eighth president in the R&D organization's 70-year history.

Stanzione will succeed John Mayo, who retires as president under AT&T's mandatory retirement rule after a distinguished 40-year career. Mayo's achievements earned him the nation's highest technical honor, the National Medal of Technology, for "providing the technological foundation for information-age communications," and "overseeing the conversion of the national switched telephone network from analog to digital-based technology."

As Bell Laboratories president, Stanzione will oversee the entire AT&T technical community and report directly to AT&T Chairman Robert E. Allen. Describing the combined technical and business strengths Stanzione brings to the position, Allen cited Stanzione's "strong technical credentials from his 17 years working at Bell Labs in areas such as sophisticated software systems, network architecture and signal processing," and his "deep understanding of the business needs of our customers from his work at Network Systems."

Stanzione has worked as a top executive in Network Systems' business units since 1989, following his career at Bell Laboratories in which he became vice president, Operations Systems and Network Planning. His current position as Global Public Networks president includes responsibility for worldwide product management, R&D and manufacturing of all switching, transmission, and network-related equipment. He has had a major role in introducing new technologies, including asynchronous transfer mode.

Commenting on the linkage between business and technology, Stanzione said, "The movement of technical people — like me — between Bell Labs and AT&T's business units reinforces the strong ties between our technology programs and our customers' needs."

L. DENISE BEARDEN
AT&T
AMY R. FLAX
BRYAN S. KATZ
AT&T Bell Laboratories

DEFINITY Platform Delivers Multimedia Today

The DEFINITY Communications System provides a multimedia communications platform today and is poised for the future.

The best of the voice and data worlds will meet in a multimedia communications network.

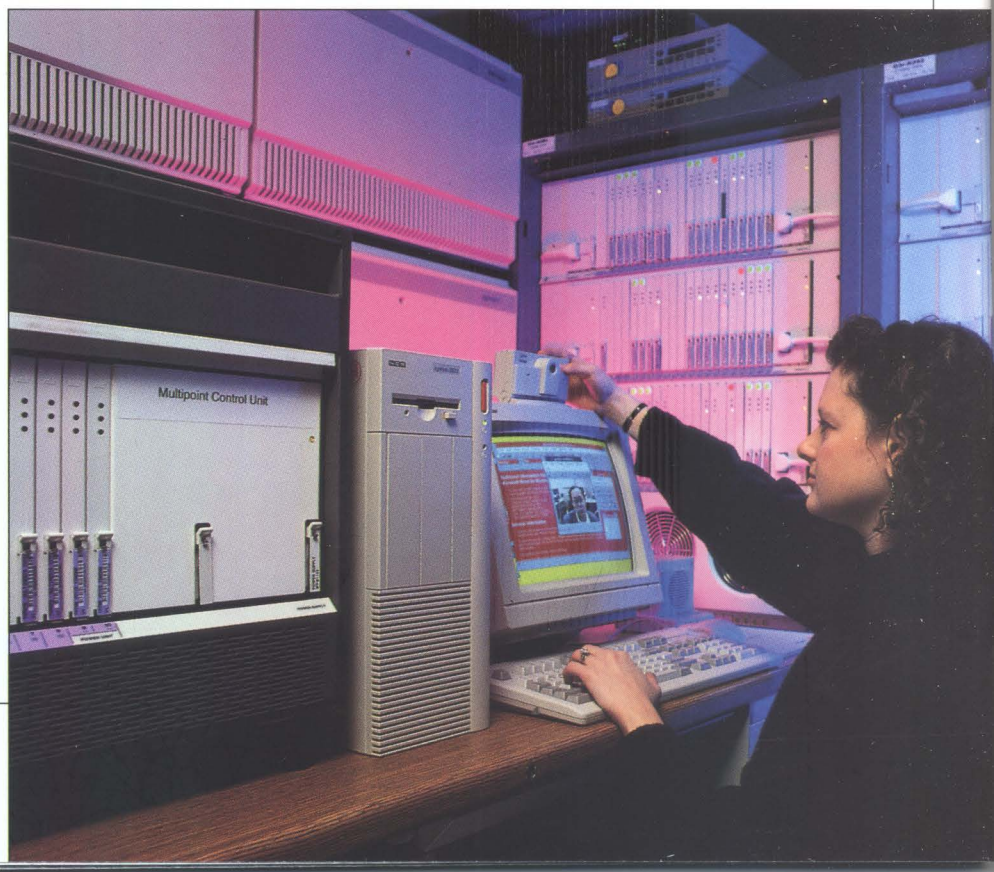
Video conference calls, video on the desktop, data sharing in real time and many other multimedia applications are available today to AT&T customers on the DEFINITY® Communications System. These applications are merely the opening salvo in what will become a rapid-fire delivery of new multimedia services from AT&T.

A global hardware and software platform, the DEFINITY Generic 3 Communications System supports multimedia calling capabilities from desktops to conference rooms to remote locations. Customers eager for more efficient and cost-effective ways to exchange and process information can talk to each other, see each other and work together in real time, with applications built around the DEFINITY System's proven reliability.

The system's flexible hardware and software architecture supporting today's multimedia applications will allow ease of evolution as these capabilities are enhanced. Ultimately the system will make a multimedia call as easy as a voice call is now.

Voice communications and data communications today exist in worlds that are largely separate and different; each has its unique capabilities, optimized for different environments. The voice communications capabilities that are available on the system include:

☐ Real-time call control, allowing the system to provide a full range of rich business features; for example, call coverage, call pickup, and call transfer



as well as sophisticated applications such as Advanced Call Center and multipremises networking (see "Advanced DEFINITY Call Centers: Working for You and Your Customers," *AT&T Technology*, Volume 9, Number 2, 1994).

☐ Local- and wide-area switching to optimize call routing and cost control on a call-by-call basis.

☐ Enterprise network management for consistent and easy operations.

Businesses benefit from high reliability, security, least-cost routing, low overhead and usage-based billing and accounting that are built into the system.

Data communications, on the other hand, uses connectionless protocols. Information is generally not transmitted in real time but in a store-and-forward mode. Typically, data systems are designed for an environment where delay is tolerable and retransmission is acceptable. The advantages of the data communications architecture include:

☐ High-speed interfaces, ranging from kilobytes to several megabytes, which relieve congestion and allow smoother access to applications residing on servers.

☐ Multivendor interoperability, which offers a mix-and-match equipment environment. Hardware components as well as software from many vendors work compatibly in data systems.

As both equipment and user needs become more advanced, the best of both the voice and data communications worlds will be integrated into a multimedia communications network, combining the flexibility and reliability of the voice environment with the variable bandwidth and open-systems architecture of the data world. Major advantages to customers will include:

☐ Scalable bandwidths that allow customers to select the bandwidth appropriate to the particular call—narrowband, wideband and, eventually, broadband—based upon quality and cost parameters.

☐ Both real-time and store-and-forward controls and protocols will let people work together and share data. Multimedia conferences or one-to-one multimedia calls will be set up as easily as voice calls from a desktop device. And that same device will be used to make calls and access applications that don't require the real-time element such as integrated voice, fax and e-mail messaging, or database access.

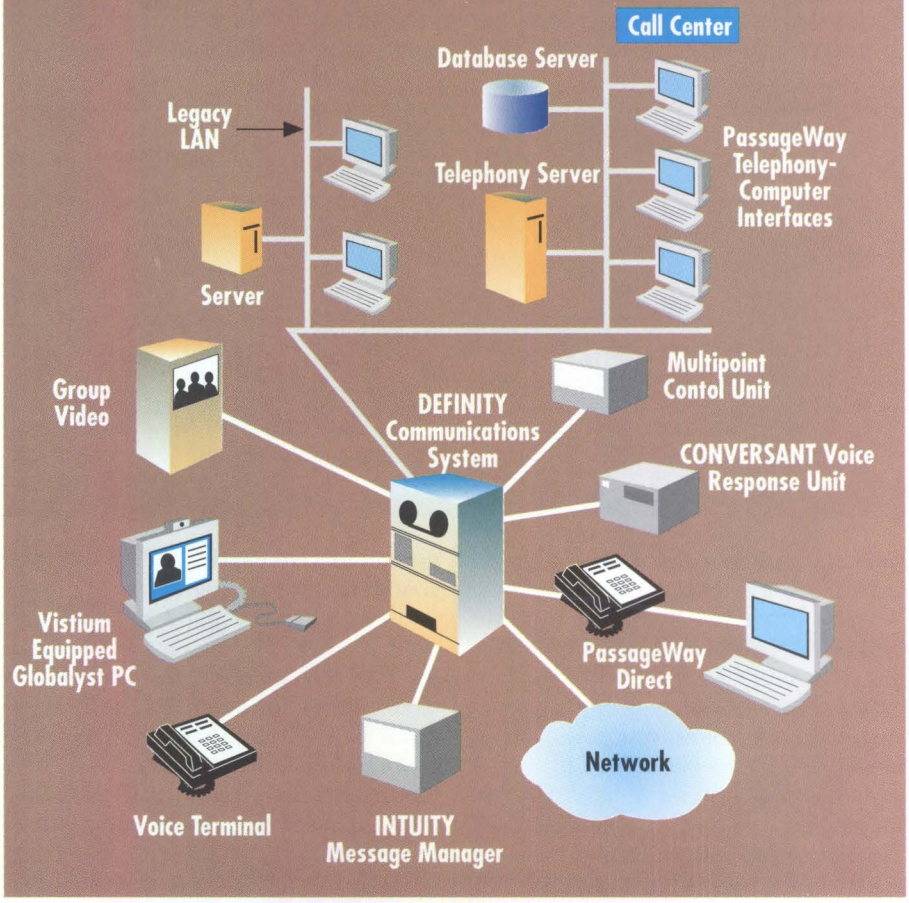
☐ Anytime, anywhere communications allows users to place voice calls without knowing what network services or types of telephones are available on the other end. Ultimately, multimedia calling will have this same ease of use and ubiquity, much like faxing today.

☐ Applying business features to multimedia will allow customers to conduct business in familiar ways but in a richer communication environment.

☐ Enterprise network management for multimedia devices will provide fault, performance and configuration management from a single platform for all the elements in the network.

The platform will give multimedia calls the features that phone calls have now.

The DEFINITY platform's capabilities complement a range of AT&T multimedia products and services now available. Customers can choose the solution(s) most applicable to their business needs to provide the advantages of today's integrated communications.



DEFINITY System customers can begin using end-to-end multimedia solutions today by adding a Vistium™ Personal Video System. The AT&T MultiPoint Control Unit (MCU) is at the far left, the DEFINITY System is at the rear, illustrating that the MCU is based on the DEFINITY architecture.

ARCHITECTURE FOR TOMORROW

The DEFINITY platform architecture decouples the switching fabric (interconnection function) from call control, making it easy to add new software and hardware for new services and interfaces as they emerge. It also permits use of the same call-control procedures and business features for different transport

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Virtual Meeting Service–Concepts And Architecture

In virtual meetings, computer and network technology will preserve nearly all the direct and subtle communication among conferees.

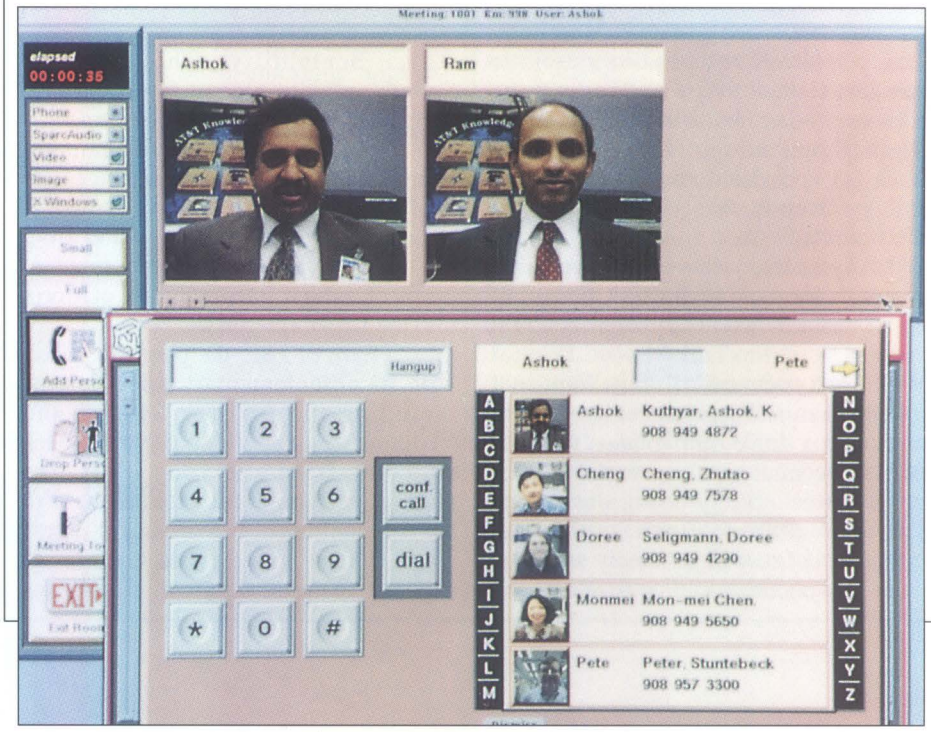
Conference latecomers will be able to scan through a digital recording–stored in the network–to see what happened before.

Ever since Adam first smiled at Eve, there have been face-to-face meetings. And, as with Adam and Eve, a lot happens whether we're meeting casually in hallways or formally in conference rooms. We read each others' body language, make eye contact, constantly interrupt each other, walk in and out of meetings in progress and whisper to each other. In more formal meetings, we share information on pieces of paper and brainstorm on whiteboards; we annotate in writing and comment orally.

The directness and subtlety—the sheer amount of communication—achieved in face-to-face meetings makes them necessary to interactions of all kinds. They build trust, deepen understanding, make agreement come faster. But there are inconveniences. People must come together, sometimes traveling long distances. And they must come together at the same time. Sometimes juggling schedules takes far more time than the meeting itself. And if someone misses a meeting, it's very hard to get the full benefit of all that went on.

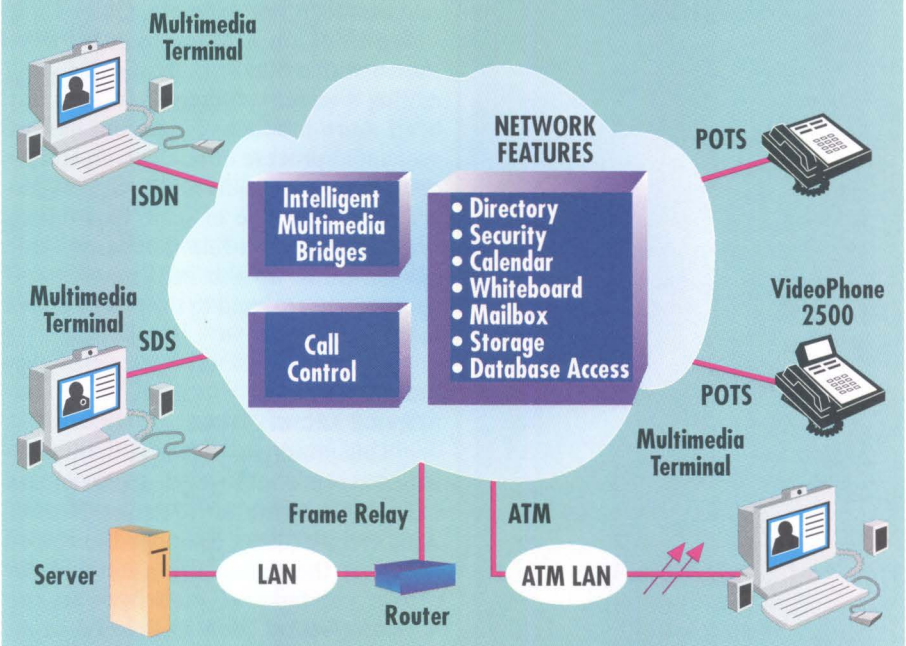
Computer and network technology can be used to help people meet so that nearly all of the communication (direct and subtle) is preserved—and so that meetings are made more convenient and even more effective. Moreover, these computer-assisted meetings will be as easy to arrange as simple phone calls are today. Our vision is based on a prototype, developed about three years ago, called Virtual Meeting Service (VMS), which is narrowband (ISDN) and broadband (ATM) based.

In 1994 an early version of VMS,



VMS BASED ON COMMUNICATIONS BROKER ARCHITECTURE

The Communications Broker Architecture will enable AT&T to be a market leader in the multimedia communications industry. The architecture specifies a core set of capabilities, enabling the network to provide seamless end-to-end services.



called WorldWorx℠ Service, became available using ISDN-BRI transport, and at least some of the needed network features began replacing some amount of travel. Over time more and more capabilities will be implemented, including wider bandwidth-on-demand, easier-to-use graphical user interface and eye contact. These will result in heightened virtual presence, resulting in less and less travel.

THE VIRTUAL MEETING

Virtual meetings, we believe, will be something like this: People will behave as they do in real face-to-face meetings. They'll be able to read body language and facial expressions, see gestures, whisper, interrupt others, and collaborate on documents or video programs. They'll be able to arrive late, and adjourn and restart the meeting. People will be able to drop out briefly to take a call or confer with someone not in the meeting. If people are missing, you'll be able to leave a multimedia message for them. Latecomers will be able to scan through a digital recording (stored in the network) of the conference to see what's happened before—with all the verbal and nonverbal information intact. Any number of people will be able to meet together.

Speech will be as in a normal meeting—the conversational ball will bounce back and forth as people interrupt. People will be able to choose to have the network transmit images from each participant in turn, or follow who's speaking. Any user will be able to share a document from his or her PC with any or all others in the meeting, and each person will be able to amend the document. Participants will also be able to work on an electronic whiteboard.

Connections will be as easy as placing a phone call today. At the command of a participant, the network will establish the multiple links for voice, video, and data automatically. And when someone drops out, the network will remember the links and be able to set them up again automatically if the person wants to rejoin the meeting. Video quality can be very high. The user will be able to select ATM/SONET transmission rates for the need at hand, but sufficiently high quality will be available for a truly virtual-premises capability.

Such virtual meetings will be more effective than actual ones, because all of the resources of each person's office—and of external databases—will be available to the meeting. For example, no one will have to run back to the office for a file. Any file on any participant's PC will be accessible for electronic sharing; any documents in the office but not on the computer will also be readily available and can be scanned in with a scanner. Of course, no one will have to travel, and people who step out temporarily will have all of their normal office resources available—they won't be stranded as when they're away.

PROTOTYPE SERVICE

Although this description has been couched in terms of the future, many aspects of it are already functioning in a trial at AT&T Bell Laboratories. The trial includes some 25 participants in four locations in New Jersey, one location in Illinois, and one location in Colorado. In addition, demonstration systems have been operating at the Network of the Future Showcase in San Francisco and Infomart in Dallas. In the trial and the demonstrations:

- ☐ Users can call on the network to do the dialing for all the media needed—they'll simply point to an icon and ask the network to place the call.
- ☐ Users can add or drop voice or video as desired during the meeting.
- ☐ The network enables different workstation platforms at the end point (Macintosh[1] and Sun UNIX[2]) and applications in each to work together.
- ☐ The network mediates across more than one network technology, enabling, say, ISDN and POTS to be linked. A prototype audio bridge supported ISDN and POTS phones.
- ☐ Participants can subconference, mute the audio portion, cut off the video transmission, and put a videoconference call on hold.
- ☐ People can also leave and rejoin meetings, or join other meetings in progress.

The trial service has been very popular. Participants like the level of communication it provides—virtual face-to-face makes for more effective discussions among coworkers. They

This screen offers a clue to what's coming in multimedia. At the top are the faces of two participants in a call; more can be shown by scrolling. A pictorial phone directory is at the lower right; the dial at the left is for conventional calling.

VISION OF A VIRTUAL MEETING

Co-workers in several states are finishing up a response to a proposal request. Sue, in New York, calls Jim in Los Angeles, Kay in Chicago, and Sam in Hawaii. Sam's multimedia workstation displays his talking head as Sue sees it; he tells her he'll be late. Jim and Kay are on line; Sue chooses to see a quarter-screen view of Jim and an icon-sized view of Kay. She brings up some last-minute pricing information in a window she designates as shared space and tells the service that Jim and Kay are to be allowed to modify it.

Jim suggests that another colleague in London, Irv, who's just seen the customer, may have some good input, and they call him on his car phone. Once he's made his report, he drops off, and Sam finally joins the meeting. He's already reviewed the part he missed, which has been stored digitally. Now, Sue adds him to her icon list and briefs him privately on a few items. Then, all four work on the quote.

Sue sees Kay shaking her head, changes the image size on her screen from icon to full-size, and asks Kay to clarify her questions. After an hour, they break so Sue, Jim, and Kay can have dinner and Sam can have lunch, informing the network they'll be resuming. After the meal, the network remembers the connections, and reestablishes the meeting. When they finally adjourn, Sue requests an electronic transcript, annotates it, and transmits it to her boss.

also like the flexibility of these computer-assisted meetings—the ability to leave and rejoin meetings and to have subconferences with others in or not in the meeting. The ability of the network to record meetings has been simulated with a VCR, and participants have found it valuable to catch up with what they missed.

Because the network in the trial does bring some different platforms and network technologies together, trial participants have also been able to share documents with each other and collaborate on them. For example, QuickTime[1] video clips on a Macintosh PC were shared with a Sun UNIX terminal. Jointly editing a paper on screen has definitely been more productive than the normal sequential process of one person editing and then the next. In addition, coworkers have been able to share data during meetings from on-line databases—one person pulls up the information and decides what to send to the PCs of others in the meeting.

NETWORK-BASED SERVICE ARCHITECTURE

This prototype VMS is built upon an innovative end-to-end architecture called the Communications Broker Architecture (CBA), developed to embed many of the capabilities needed for effective, natural meetings in the network, rather than in the end-point systems. Actually VMS is based on a research effort called Rapport, which created a virtual meeting room in a premises environment. Rapport also depended on end-point intelligence without centralized servers. CBA was created to provide a network-based service model for the Rapport concept. CBA embodies four crucial concepts:

☐ People can use any type of computer (PC, Macintosh, UNIX based, etc.).

☐ Users can reach the network with any type of access (POTS, ISDN, frame relay, asynchronous transfer mode, etc.).

☐ People can use any type of multimedia capability (videocamera, phone, computer).

☐ The network provides interworking, bridging, and additional value-added capabilities.

CBA thus resolves many of the problems facing present multimedia systems, which are typically characterized by a lack of platform interoperability, and network interworking. The architecture can be defined as a client/server software infrastructure that supports dynamic negotiation for communication, provides a context, manages resources, and enhances reusability of software and hardware components. This last is especially important so users can begin installing virtual meeting systems now—for example, the AT&T Globalyst™ computers and Vistium™ products described in this issue—and evolve the initial service to a broader one as incremental enhancements become available.

WHAT USERS WANT IN A VIRTUAL MEETING

With this architecture as a basis, and drawing on our experience with virtual meetings, we've identified a number of requirements we view as crucial if these meetings are to be as effective as actual ones—or more so. Among them:

☐ The user will want to call another person, not a list of numbers, to set up the multimedia links. For example, you should be able simply to select a photo or name from a pictorial phone directory or dial it on a conventional keyboard or keypad; the VMS network will be able to dial up the data, voice, and video links needed.

☐ The user should be able to select the combination of media dynamically. The person must be able to choose voice and video initially, then add data and perhaps turn off the video—to save money or to use the full screen for collaborative work.

☐ The user will want to communicate with workstations having different operating systems. It won't matter what platform is used on both ends—the network should be able to mediate between them, just as the public telephone network does now between different makes of phones and modems. This is especially important because the desktop PC not only provides a user-friendly interface for managing the call, but also contains applications software such as spreadsheets and word processors. Any work that users may want to collaborate on should thus be linked to a specific desktop platform. Because the network converts from one format to another, people with different platforms should be able to share applications and documents.

☐ Conference participants should be able to reach anyone over any network. Most of today's desktop multimedia conferencing systems require not only the same desktop platform, but also the same type of network access. But for a virtual meeting to be effective, users must be able to reach others in dif-

ferent types of networks. A caller with national ISDN access should be able to call someone with T1 or ATM access. The network must do the translating.

☐ People will be able to behave as they do during actual meetings. They'll be able to whisper and pass notes; leave the meeting; have conferences with other people; and manage phone communications by holding, forwarding, muting and by leaving messages.

☐ The user will also be able to call up the digital recording of what happened during the interim; after the user scans it, the network will automatically put him or her back in the meeting.

Virtual Meeting Service is based on a research effort called Rapport, which created a virtual meeting room.

SPECIFIC FEATURES

Our vision of VMS translates these requirements into a number of specific features:

☐ Shared workspace—a work area on the screen accessible to participants designated by the meeting's host. (There may be several ways to amend the document, so not everyone needs to know the host word processor.)

☐ Private workspace—the user will be able to choose to exclude part of his or her screen from the meeting.

☐ Network whiteboard—displayed as a data window, this whiteboard is written on freehand using "paint" programs. VMS provides a different color "ink" for each participant, and stores the notations as part of the meeting record.

☐ Conference/storage review (called visual meeting minutes)—all of the meeting will be recorded, and any authorized user will be able to view the meeting later. Users will be able to scan forward or back, or search for key phrases. Entire conferences or symposia could be recorded—viewers will choose to see only certain talks or ask the network to search for any part of the conference that discussed a specified subject.

☐ Subconferencing—the user will be able to leave the current meeting briefly and have a smaller, private conference with one or more other people either at the meeting or not. Participants will have the chance to whisper or pass notes as they do in actual meetings. Information in the subconference won't be available to the larger meeting.

☐ Information service provider access/gateway—information from on-line databases external to participants' workstations will be able to be brought into the meeting. The person who accesses the database will be able to choose which information to share and with whom.

☐ VMS call and connection management—the service will handle maintenance of the conference, media synchronization, and other tasks. For example, it ensures that video and audio signals from one workstation arrive at the others in synch, and that shared documents arrive at all workstations simultaneously.

☐ High-quality video—the video information will be displayed in a window on the desktop monitor; the camera provides eye-to-eye contact. The user will select the size of the window in which to view any other participant, choose different sizes for different participants, and zoom up or down in size as desired. For example, the user will make an image larger to see facial expressions better, or make it smaller to create more room for a shared document. The user will also be able to view himself or herself.

☐ High-quality audio—the audio signal will be interruptible so speakers can interrupt each other without fear of clipping. Sophisticated signal processing will eliminate echoes and take room acoustics into consideration. Directional sound will help the user identify the the speaker based on the location of the speaker's image on the screen.

THE INEVITABLE MEETING

Crucial to achieving seamless, natural, effective virtual meetings will be agreement among industry players and standards bodies on common specifications. AT&T is committed to working with others in the industry to ensure that the requisite standards are written. Once common specifications are available, we expect that virtual meetings will be inevitable. They offer too many advantages and can enhance too many business undertakings. From our experience, they are as satisfying as the real thing.

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1—Macintosh is a registered trademark and QuickTime is a trademark of Apple Computer, Inc.

2—UNIX is a registered trademark in the United States and other countries, licensed exclusively through X/OPEN Corp.

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CUMULATIVE INDEX

AT&T TECHNOLOGY
Vol. 9, No. 1 — Vol. 9, No. 4

800 MEGACOM® Number, Vol. 9, No. 2, 9

800 Speech Recognition Service, Vol. 9, No. 1, 24

A

A-I-Net® Products, Vol. 9, No. 1 , 3, 8, 10

A-I-Net Products Bring New Services to Life, Vol. 9, No. 1, 10

ACCESS System Speeds Trading of Energy Futures, Vol. 9, No. 2, 12

ACCU-Ring℠ Network Access Service, Vol. 9, No. 3, 20

ACCUNET® Transmission Services, Vol. 9, No. 2, 5; No. 3, 21

Advanced DEFINITY®Call Centers: Working for You and Your Customers, Vol. 9, No. 2, 6

Advanced Intelligent Network, Vol. 9, No. 1, 10

American Computerized Commodity Exchange Systems and Services (ACCESS), Vol. 9, No. 2, 12

Anderson, Chester W., The Systems That Listen, Speak and Understand, Vol. 9, No. 1, 2

AT&T Worldwide Intelligent Network, Vol. 9, No. 2, 31

Automated Position System (APS), Vol. 9, No. 1, 23

Automatic Number Identifier (ANI), Vol. 9, No. 2, 7

B

BaseWorX™ Applications Platform, Vol. 9, No. 2, 28

Basore, David L., The Systems That Listen, Speak and Understand, Vol. 9, No. 1, 2

Bearden, L. Denise, **DEFINITY** Platform Delivers Multimedia Today, Vol. 9, No. 4, 24

Blevins, Terry, Planning Distributed Computer Systems, Vol. 9, No. 3, 14

Bringing an Industry Closer Together, Vol. 9, No. 3, 28

Broadband Goes to Business...Now, Vol. 9,No. 3, 24

Business Translations for Global Partners, Vol. 9, No. 1, 28

BYNET™ Interconnect, Vol. 9, No. 3, 6

C

Call Management System, Vol. 9, No. 2, 9

CALLMASTER® Station Set, Vol. 9, No. 2, 8

CallVisor™ Adjunct/Switch Applications Interface (ASAI) Software, Vol. 9, No. 2, 7

Committed Information Rate (CIR), Vol. 9, No. 3, 25

Common Object Request Broker Architecture **(CORBA),** Vol. 9, No. 2, 31

CommStation™ Computer Housing, Vol. 9, No. 2, 5

Computer-Telephone Integration **(CTI),** Vol. 9, No. 3, 10

Computer-Telephone Integration Empowers the Desktop, Vol. 9, No. 3, 10

CONVERSANT VIS Listens and Talks to Your Customers, Vol. 9, No. 2, 22

CONVERSANT® Voice Information System **(VIS),** Vol. 9, No. 1, 3, 14; No. 2, 22

Cordom, Christopher, **CONVERSANT VIS** Listens and Talks to Your Customers, Vol. 9, No. 2, 22

Cosgrove, James G., The Single Face of Multimedia, Vol. 9, No. 4, 2

Customer Network Management Advanced Report, Vol. 9, No. 3, 27

Customer Network Management Services, Vol. 9, No. 3, 26

Customers Say: Personal Means More Productive, Vol. 9, No. 4, 8

D

DeBrosse, Dennis J., Planning Distributed Computer Systems, Vol. 9, No. 3, 14

DEFINITY® Platform Delivers Multimedia Today, Vol. 9, No. 4, 24

DEFINITY Telecommunications System, Vol. 9, No. 1, 17; No. 2, 6, 16; No. 3, 11

DeNigris, Ernest G., Work-Together Calls Expand Your Capabilities, Vol. 9, No. 4, 4

Desai, Satish, Software Productivity Takes a Giant Step, Vol. 9, No. 2, 28

Dialed Number Identification Service **(DNIS),** Vol. 9, No. 2, 9

F

Flax, Amy R., **DEFINITY** Platform Delivers Multimedia Today, Vol. 9, No. 4, 24

FlexWord™ Automatic Speech Recognition **(FlexWord ASR),** Vol. 9, No. 1, 16

Florkey, Cynthia, Just Say the Word for Service, Vol. 9, No. 1, 4

Foard, Christopher F., Computer-Telephone Integration Empowers the Desktop, Vol. 9, No. 3, 10

Focusing on the Customer Once Removed, Vol. 9, No. 2

Forlenzo, Don J., Stretching the Range of Wireless Communications, Vol. 9, No. 2, 16

Foster, Robin Harris, Advanced **DEFINITY** Call Centers: Working for You and Your Customers, Vol. 9, No. 2, 6

G

Getting, Moving and Using Customer Information, Vol. 9, No. 2, 2

GlobeView™ 2000 Broadband System, Vol. 9, No. 3, 27

H

Haszto, Edward D., Talking to the Network, Vol. 9, No. 1, 22

Howe, Robert M. III, **Vistium™** Products Give Another Point of View, Vol. 9, No. 4, 18

I

InfoWorx® Interactive Voice Service, Vol. 9, No. 1, 3, 23

Integrated Services Digital Network **(ISDN),** Vol. 9, No. 2, 7

International Organization for Standardization **(ISO),** Vol. 9, No. 1, 31

InterSpan® Asynchronous Transfer Mode **(ATM)** Service, Vol. 9, No. 3, 24

InterSpan Frame Relay Service, Vol. 9, No. 3, 25

InterSpan Information Access Service, Vol. 9, No. 3, 29

InView Service, Vol. 9, No. 3, 28

J

Jahns, Teresa, Stretching the Range of Wireless Communications, Vol. 9, No. 2, 16

Just Say the Word for Service, Vol. 9, No. 1, 4

K

Kargol, Barbara A., Computer-Telephone Integration Empowers the Desktop, Vol. 9, No. 3, 10

Katz, Bryan S., **DEFINITY** Platform Delivers Multimedia Today, Vol. 9, No. 4, 24

Keeping Our Customers Well Connected, Vol. 9, No. 3

Koenig, Mark J., **MCUs** Help Take the Worry Out of Being There, Vol. 9, No. 4, 12

Krasinski, Daniel J., Just Say the Word for Service, Vol. 9, No. 1, 4

Kuthyar, Ashok K., Virtual Meeting Service—Concepts and Architecture, Vol. 9, No. 4, 28

L

Longenbaker, William E., Talking to the Network, Vol. 9, No. 1, 22

M

Machine Translation **(MT)**, Vol. 9, No. 1, 30

Marutiak, David J., **A-I-Net** Products Bring New Services to Life, Vol. 9, No. 1, 10

Massively Parallel-Processing **(MPP)** Computer, Vol. 9, No. 3, 2

McCarthy, Leonard D. Jr., The Single Face of Multimedia, Vol. 9, No. 4, 2

McGuire, Angie, Getting, Moving and Using Customer Information, Vol. 9, No. 2, 2

MCUs Help Take the Worry Out of Being There, Vol. 9, No. 4, 12

MERLIN® Communications System, Vol. 9, No. 2, 16; No. 3, 11

Moats, Ryan, Broadband Goes to Businesse Now, Vol. 9, No. 3, 24

Morgan, Dennis J., Opening Up Speech Processing, Vol. 9, No. 1, 14

MPP Breaks the Information Barrier, Vol. 9, No.3, 2

Multi-Application Platform Solution **(MAPS)**, Vol. 9, No. 1, 15; No. 2, 22

Multiline Digital Wireless **(MDW)** 9000 Handset, Vol. 9, No. 2, 16

Multiple National Language Support **(MNLS)** Service, Vol. 9, No. 2, 30

N

Network Cellular Voice Digit Dialing, Vol. 9, No. 1, 6

O

Object-Oriented Technology **(OOT)**, Vol. 9, No. 2, 28

O'Flaherty, Kenneth W., MPP Breaks the Information Barrier, Vol. 9, No.3, 2

One Vision® Software, Vol. 9, No.3, 7

Open Cooperative Computing Architecture **(OCCA)**, Vol. 9, No. 3, 14

Open Systems Interconnection Common Management Information Protocol **(OSI-CMIP)**, Vol. 9, No. 2, 30

Opening Up Speech Processing, Vol. 9, No. 1, 14

O'Shea, William T., Keeping Our Customers Well Connected, Vol. 9, No. 3

P

PARTNER® Communications System, Vol. 9, No. 2, 16; No. 3, 11

PassageWay™ Solutions, Vol. 9, No. 3, 11

Pavarini, Carl, Customers Say: Personal Means More Productive, Vol. 9, No. 4, 8

Pavarini, Carl, The Single Face of Multimedia, Vol. 9, No. 4, 2

Payseur, John Y., Opening Up Speech Processing, Vol. 9, No. 1, 14

Permanent Virtual Circuit **(PVC)**, Vol. 9, No. 3, 25

Personal Communications Service **(PCS)**, Vol. 9, No. 2, 19

Pilc, Randolph J., The Systems That Listen, Speak and Understand, Vol. 9, No. 1, 2

Planning Distributed Computer Systems, Vol. 9, No. 3, 14

R

Ramamurthy, Ram S., Virtual Meeting Service—Concepts and Architecture, Vol. 9, No. 4, 28

Razavi, Cyrus, Bringing an Industry Closer Together, Vol. 9, No. 3, 28

Reagan, Frank J., ACCESS System Speeds Trading of Energy Futures, Vol. 9, No. 2, 12

ReliaBURST™ Capability, Vol. 9, No. 3, 25

Reynolds, Donnie, Business Translations for Global Partners, Vol. 9, No. 1, 28

Robinson, Michael J., Solving the Access Outage Problem, Vol. 9, No. 3, 20

Roscigno, Michael P., Jr., Software Productivity Takes a Giant Step, Vol. 9, No. 2, 28

Rossmann, Raymond A., ACCESS System Speeds Trading of Energy Futures, Vol. 9, No. 2, 12

S

Sanakkayala, Bhaskar N., Opening Up Speech Processing, Vol. 9, No. 1, 14

Scherer, James B., Talking to the Network, Vol. 9, No. 1, 22

Scott, Edward D., MPP Breaks the Information Barrier, Vol. 9, No.3, 2

Searles, Kendall S., **CONVERSANT VIS** Listens and Talks to Your Customers, Vol. 9, No. 2, 22

Service Circuit Node **(SCN)**, Vol. 9, No. 1, 4

Software Productivity Takes a Giant Step, Vol. 9, No. 2, 28

Solving the Access Outage Problem, Vol. 9, No. 3, 20

Stead, Jerre, Focusing on the Customer Once Removed, Vol. 9, No. 2

Steele, Gregory, Planning Distributed Computer Systems, Vol. 9, No. 3, 14

Stretching the Range of Wireless Communications, Vol. 9, No. 2, 16

Structured Query Language **(SQL)**, Vol. 9, No. 3, 5

Stuntebeck, Peter H., Virtual Meeting Service—Concepts and Architecture, Vol. 9, No. 4, 28

Synchronous Optical Network **(SONET)**, Vol. 9, No. 3, 24

System 3600, Vol. 9, No. 3, 2

T

Talking to the Network, Vol. 9, No. 1, 22

Telecommunications Management Network **(TMN)**, Vol. 9,No. 2, 30

The Single Face of Multimedia, Vol. 9, No. 4, 2

The Systems That Listen, Speak and Understand, Vol. 9, No. 1, 2

Thompson, John, Bringing an Industry Closer Together, Vol. 9, No. 3, 28

TransTalk™ 9000 Digital Wireless System, Vol. 9, No. 2, 16

V

Vance, Allen, Bringing an Industry Closer Together, Vol. 9, No. 3, 28

Vector Directory Number **(VDN)**, Vol. 9, No. 2,9

Virtual Meeting Service—Concepts and Architecture, Vol. 9, No. 4, 28

Vistium Products Give Another Point of View, Vol. 9, No. 4, 18

Voice Interactive Phone **(VIP)**, Vol. 9, No. 1, 6

Voice Recognition Call Processing **(VRCP)**, Vol. 9, No. 1, 23

W

Ward, Joseph A., Solving the Access Outage Problem, Vol. 9, No. 3, 20

Welt, Martin J., **MCU**s Help Take the Worry Out of Being There, Vol. 9, No. 4, 12

Werner, Thomas S., Solving the Access Outage Problem, Vol. 9, No. 3, 20

Who's Calling?, Vol. 9, No. 1, 4

Wireless Centrex System, Vol. 9, No. 2, 19

Wisowaty, John J., Just Say the Word for Service, Vol. 9, No. 1, 4

Work-Together Calls Expand Your Capabilities, Vol. 9, No. 4, 4

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